



GRAVELLY FORD WATER DISTRICT

18811 Road 27· Madera, CA 93638 (559) 474-1000 Fax: (559) 673-1086

Board of Directors

Timothy DaSilva, Pres.
Steven Emmert, V. Pres.
Kenneth Basila
James Keating
Seth Kirk

Manager

Don Roberts

Rick J Woodley
Regional Resources Manager
MidPacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

December 13, 2012

RE: MP 410
WTR-4.00
Water Management Plan - Gravelly Ford Water District

Dear Mr. Woodley:

In accordance with your letter dated November 28, 2012, we have sent an electronic copy of the final Plan and a Resolution of the Board of Directors adopting the Plan to Melissa Crandall at mcrandall@usbr.gov.

Please contact me if you need any additional information at (559) 474-1000.

Sincerely,

Don Roberts

General Manager

**GRAVELLY FORD WATER DISTRICT
RESOLUTION NO. 12-02
WATER MANAGEMENT PLAN**

WHEREAS, the Central Valley Project Improvement Act of 1992 (Title XXXIV, Public Law 102-575, 106 Stat. 4713) requires the Secretary of the Interior to establish an office to develop criteria for evaluating water management plans developed by CVP contractors, and to evaluate the adequacy of plans submitted by project contractors; and

WHEREAS, the Reclamation Reform Act of 1982 (Public Law 97-293; 43 U.S. 390jj) requires districts with repayment or water supply contracts to develop and maintain water management plans containing definite goals, appropriate water conservation measures, and time schedules for meeting conservation and management objectives in accordance with the 2008 Standard Criteria; and

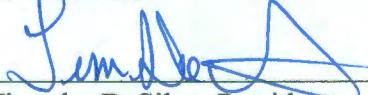
WHEREAS, the Gravelly Ford Water District has such a water supply contract and has therefore prepared the required update to the District's Water Management Plan.

NOW THEREFORE, BE IT RESOLVED, that the Water Management Plan (Draft) is adopted by the District.

PASSED AND ADOPTED THIS 12th day of December 2012 by the following vote:

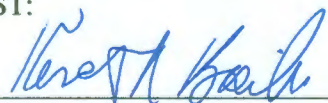
Directors Voting Aye: *Emmert, DaSilva, Basila, Kirk, Keating*
Directors Voting No: *NONE*
Directors Abstaining: *NONE*
Directors Absent: *NONE*

APPROVED



Timothy DaSilva, President

ATTEST:



Kenneth Basila, Secretary



**Gravelly Ford Water District
2009 Water Management Plan**

Date of final – (10-04-2012)

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Section 1: Description of the District

District Name: *Gravelly Ford Water District*_____

Contact Name: *Don Roberts*_____

Title: *Manager*_____

Telephone: *(559) 474-1000*_____

E-mail: *donroberts717@gmail.com*_____

Web Address _____

A. History

1. Date district formed: *June 15, 1962*_____ Date of first Reclamation contract: *July 26, 1981*

Original size (acres): *10,398 acres*_____ Current year (last complete calendar year): *2009*_____

2. Current size, population, and irrigated acres

	<i>2009</i>
<i>Size (acres)</i>	<i>8314</i>
<i>Population served</i>	<i>0</i>
<i>Irrigated acres</i>	<i>7672</i>

3. Water supplies received in current year

<i>Water Source</i>	<i>AF</i>
<i>Federal urban water (Tbl 1)</i>	<i>0</i>
<i>Federal agricultural water (Tbl 1)</i>	<i>1701</i>
<i>State water (Tbl 1)</i>	<i>0</i>
<i>Other Wholesaler (define) (Tbl 1)</i>	<i>0</i>
<i>Local surface water (Tbl 1)</i>	<i>0</i>
<i>Upslope drain water (Tbl 1)</i>	<i>0</i>
<i>District ground water (Tbl 2)</i>	<i>0</i>
<i>Banked water (Tbl 1)</i>	<i>0</i>
<i>Transferred water (Tbl 6)</i>	<i>0</i>
<i>Recycled water (Tbl 3)</i>	<i>0</i>
<i>Other (define) (Tbl 1) Madera I D</i>	<i>386</i>
<i>Total</i>	<i>2087</i>

4. Annual entitlement under each right and/or contract

	<i>AF</i>	<i>Source</i>	<i>Contract #</i>	<i>Availability period(s)</i>
<i>Reclamation Urban AF/Y</i>	<i>0</i>			

<i>Reclamation Agriculture AF/Y</i>	14000	USBR Class 2 SJR	1-07-20-W0242-LTR1	Mar 1 - Feb. 28 subject to declaration by USBR based on projected runoff in San Joaquin River. Class 2 water is non firm and is often required to be used in the March-June period.
<i>Other AF/Y (LOCAL)</i>		Cottonwood Creek	State permit 016060	Subject to irregular flows; ephemeral stream. Often dry
<i>Other AF/Y(OTHER)</i>		Madera ID Lateral 6.2		Unregulated spill water from during their water season. Usually April-September subject to their water supply.

5. *Anticipated land-use changes*
None

6. *Cropping patterns (Agricultural only)*

List of current crops (crops with 5% or less of total acreage) can be combined in the 'Other' category.

<i>Original Plan (1986)</i>		<i>Previous Plan (1998)</i>		<i>Current Plan</i>	
<i>Crop Name</i>	<i>Acres</i>	<i>Crop Name</i>	<i>Acres</i>	<i>Crop Name</i>	<i>Acres</i>
Alfalfa	860	Alfalfa	426		
Almonds	880	Almonds	1094	Almonds	2147
Cotton	1070	Cotton	1425		
Grapes	3620	Grapes	4041	Grapes	3498
				Pistachios	1085
<i>Other (<5%)</i>	1036	<i>Other (<5%)</i>	320	<i>Other (<5%)</i>	942
<i>Total</i>	7416		7306	<i>Total</i>	7672

(See Planner, Chapter 2, Appendix A for list of crop names)

7. *Major irrigation methods (by acreage) (Agricultural only)*

<i>Original Plan (1986)</i>		<i>Previous Plan (1998)</i>		<i>Current Plan</i>	
<i>Irrigation Method</i>	<i>Acres</i>	<i>Irrigation Method</i>	<i>Acres</i>	<i>Irrigation Method</i>	<i>Acres</i>
Flood	5346	Flood	1865	Flood	2378
Furrow	2070	Furrow	1425		
		Sprinkler/Drip	3653	Drip/Micro	4917
<i>Other</i>		<i>Other</i>		<i>Other Sprinkler</i>	377
<i>Total</i>	7416	<i>Total</i>	7306	<i>Total</i>	7672

(See Planner, Chapter 2, Appendix A for list of irrigation system types)

B. Location and Facilities

See Attachment A for points of delivery, turnouts (internal flow), and outflow (spill) points, measurement locations, conveyance system, storage facilities, operational loss recovery system, wells, and water quality monitoring locations

1. Incoming flow locations and measurement methods

<i>Location Name</i>	<i>Physical Location</i>	<i>Type of Measurement Device</i>	<i>Accuracy</i>
GF Canal	San Joaquin River	Flow meter	± 2%
South Line	MID Lat 6.2	Flow meter	± 2%
Cottonwood Creek	Rd. 20	Weir	± 5%

2. Current year Agricultural Conveyance System

<i>Miles Unlined - Canal</i>	<i>Miles Lined - Canal</i>	<i>Miles Piped</i>	<i>Miles - Other</i>
15	0	5	0

3. Current year Urban Distribution System

<i>Miles AC Pipe</i>	<i>Miles Steel Pipe</i>	<i>Miles Cast Iron Pipe</i>	<i>Miles - Other</i>
N/A	N/A	N/A	N/A

4. Storage facilities (tanks, reservoirs, regulating reservoirs)

<i>Name</i>	<i>Type</i>	<i>Capacity (AF)</i>	<i>Distribution or Spill</i>
Secara	Reservoir	60	Percolates/Regulates

5. Outflow locations and measurement methods (Agricultural only)

Provide this information in Section 2 F.

6. Description of the agricultural spill recovery system N/A

7. Agricultural delivery system operation (check all that apply)

<i>On-demand</i>	<i>Scheduled</i>	<i>Rotation</i>	<i>Other (describe)</i>
	X	X	

8. Restrictions on water source(s)

<i>Source</i>	<i>Restriction</i>	<i>Cause of Restriction</i>	<i>Effect on Operations</i>
SJR	Lack of Supply	Lack of Supply	Limits water to growers -- more ground water pumping required by growers
MID	Lack of Supply	Lack of Supply	Limits water available to growers Requires District to use rotation rather than scheduled deliveries

Cottonwood Creek	Lack of Supply Ephemeral stream	Lack of Supply	Unable to serve a portion of the District without flows in the Creek.
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9. *Proposed changes or additions to facilities and operations for the next 5 years*

In discussion with MID for joint use of District facilities to assist in District operations and in operation of MID Water Bank

C. Topography and Soils

1. *Topography of the district and its impact on water operations and management*

Flat and smooth, gentle slope to southwest (5'/mile). Topography has no significant impact on water operations and management.

2. *District soil association map (Agricultural only)*

See Attachment B, District Soils Map

Agricultural limitations resulting from soil problems (Agricultural only)

<i>Soil Problem</i>	<i>Estimated Acres</i>	<i>Effect on Water Operations and Management</i>
Salinity		
High-water table		
High or low infiltration rates	5770	Slower infiltration rate
Other (define)		

D. Climate

1. *General climate of the district service area*

	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>	<i>Annual</i>
<i>Avg Precip.</i>	2.0	1.9	1.8	1.1	0.4	0.1	.01	.02	0.1	0.6	1.2	1.8	11.0
<i>Avg Temp.</i>	45	50	54	60	68	75	80	78	73	64	53	45	62
<i>Max. Temp.</i>	54	61	67	75	84	92	98	96	91	81	66	55	77
<i>Min. Temp</i>	36	39	42	46	52	57	62	60	56	48	40	35	48
<i>ETo</i>	1	2	4	9	13	12	16	12	10	5	2	2	88

Weather station ID 045233_____

Data period: Year 1948_____ to Year 2009__

Average wind velocity 0 - 6 mph_____

Average annual frost-free days: _____ 334

2. *Impact of microclimates on water management within the service area*

None

E. Natural and Cultural Resources

1. Natural resource areas within the service area

<i>Name</i>	<i>Estimated Acres</i>	<i>Description</i>
None		

2. Description of district management of these resources in the past or present

N/A

3. Recreational and/or cultural resources areas within the service area

<i>Name</i>	<i>Estimated Acres</i>	<i>Description</i>
None		

F. Operating Rules and Regulations

1. Operating rules and regulations

See Attachment C, District Rules and Regulations (water related)

2. Water allocation policy (Agricultural only)

See Attachment C, Page 2, Rule 4

Summary - The District makes the surface supply available to all eligible water users. When supplies are low, a rotation system is used to ensure all users get an opportunity to receive water.

3. Official and actual lead times necessary for water orders and shut-off (Agricultural only)

See Attachment C, Pages 6 & 7 Rule 6

Summary - Three day lead time for order, 24 hour lead time for shutoff. Emergency shutoffs for pipeline or pump failures and weather related problems (wind, rail, hail).

4. Policies regarding return flows (surface and subsurface drainage from farms) and outflow (Agricultural only)

See Attachment C, Page 8 Rule 14.1

Summary - Rule 14.1 requires an encroachment permit for any drains into District canals. No permits have been issued. Surface irrigation water is being retained within farm boundaries. There are no subsurface drains within the District.

5. Policies on water transfers by the district and its customers

See Attachment C, Page 5, Rule 8

Summary - District customers have no allocation to transfer. District allows growers use of District facilities to convey their water during non-delivery periods. With limited supplies, District historically didn't transfer water outside the District. In 2009, District received two limited allocations with time restrictions on use that made taking the water impractical, so this water was transferred.

G. Water Measurement, Pricing, and Billing

1. Agricultural Customers

- a. Number of farms 22
- b. Number of delivery points (turnouts and connections) 41
- c. Number of delivery points serving more than one farm 1
- d. Number of measured delivery points (meters and measurement devices) 40
- e. Percentage of delivered water that was measured at a delivery point 99

Delivery point measurement device table (Agricultural only)

Measurement Type	Number	Accuracy (+/- %)	Reading Frequency (Days)	Calibration Frequency (Months)	Maintenance Frequency (Months)
Orifices					
Propeller meter	40	±2	Daily		Annually
Weirs					
Flumes					
Venturi					
Metered gates					
Acoustic doppler					
Other (define)	1	±5		Pump Test	Annually
Total					

2. Urban Customers N/A

3. Agriculture and Urban Customers

- a. Current year agriculture water charges - including rate structures and billing frequency

The rate for water is established each year and is based on the projected available supply from the Bureau of Reclamation. Agricultural water rate for 2009 was \$40.00 per acre foot which is billed each month.

- b. Annual charges collected from customers (current year data)

Fixed Charges			
Charges (\$ unit)	Charge units (\$/acre), (\$/customer) etc.	Units billed during year (acres, customer) etc.	\$ collected (\$ times units)
5	acre	8314	41570

Volumetric charges			
Charges	Charge units	Units billed during year	\$ collected

(\$ unit)	(\$/AF), (\$/HCF), etc.	(AF, HCF) etc.	(\$ times units)
40.00	AF	580	23200.00
46.50	AF	137	6370.50

See Attachment D, District Sample Bills

c. Water-use data accounting procedures

Monthly billing is in place for each turnout and each user. District has last 5 years of delivery records in storage.

H. Water Shortage Allocation Policies

1. Current year water shortage policies or shortage response plan - specifying how reduced water supplies are allocated

The District operates as a scheduled delivery system. During periods of reduced water supply, the District uses a rotation system to ensure all growers have an opportunity for water.

2. Current year policies that address wasteful use of water and enforcement methods
See Attachment C, Page 5 Rule 9.

The District will not deliver water to a customer that has been reported by the canal operators or others as allowing water to run down roadways or has not attended to their irrigation event.

Section 2: Inventory of Water Resources

A. Surface Water Supply

1. Acre-foot amounts of surface water delivered to the water purveyor by each of the purveyor's sources

See Water Inventory Tables, Table 1

2. Amount of water delivered to the district by each of the district sources for the last 10 years

See Water Inventory Tables, Table 8

B. Ground Water Supply

1. Acre-foot amounts of ground water pumped and delivered by the district

N/A - District has no groundwater pumps

2. Ground water basin(s) that underlies the service area

Name	Size (Square Miles)	Usable Capacity (AF)	Safe Yield (AF/Y)
Madera	Unknown		

3. *Map of district-operated wells and managed ground water recharge areas*

There are no wells owned or operated by the District. The District owns a 17 acre basin which was constructed by the District and functions as a percolation basin when water is available and /or is surplus to grower deliveries. When surplus water is available from flood flows or other runoff in Cottonwood Creek, water is diverted into the Gravelly Ford Canal and conveyed north where it percolates into the underground waters. The District also places San Joaquin River water in the basin when excess flows are available. The District also uses the basin to divert flows that might otherwise potentially spill from the District.

4. *Description of conjunctive use of surface and ground water*

District has a reservoir for percolation. District's limited water supply makes operation "conjunctive use" by definition. District is in discussions with Madera Irrigation District with regard to use of District facilities to convey water to MID's proposed water bank.

5. *Ground Water Management Plan*

See Attachment G, Gravelly Ford Water District Ground Water Management Plan which was adopted April 13, 1998 and amended October 3, 2000.

6. *Ground Water Banking Plan* N/A

C. Other Water Supplies

1. *"Other" water used as part of the water supply*

See the Water Inventory Tables, Table 1

Cottonwood Creek natural flows coming into Gravelly Ford vary from 0 to something in excess of 5000 Ac. Ft. on infrequent occasions. The District has Water Right Permit No. 016060 that provides for collection to storage of up to 5,000 AF or irrigation on up to 10,000 acres. In 2009, due to a lack of flow only 23 Ac. Ft. reached the District boundary.

The District has also been authorized to divert and purchase San Joaquin River operational spill. This amount has varied from 0 to 7,000 Ac. Ft. with diversions in 2009 being 1701 Ac. Ft.

D. Source Water Quality Monitoring Practices

1. *Potable Water Quality (Urban only No potable water supply>*

2. *Agricultural water quality concerns:* Yes _____ No X_____

(If yes, describe)

3. *Description of the agricultural water quality testing program and the role of each participant, including the district, in the program*

District is a member of East San Joaquin Water Coalition that tests water in Cottonwood Creek. District's main source is S.J. River, and water quality is not an issue.

4. Current water quality monitoring programs for surface water by source (Agricultural only)

<i>Analyses Performed</i>	<i>Frequency</i>	<i>Concentration Range</i>	<i>Average</i>
See below			

See Attachment J for test results for Cottonwood Creek at Rd 20 as provided by the East San Joaquin Water Coalition. It should be noted that some of the results are deceptive, in that there was no flow in the Creek when some samples were taken for analyses. For example when the Feb 2009 sample was taken, there had been no flow in the Creek for several months. The District has been advised that even if there is only small puddle of water at the specified site, a sample is to be taken and a test run. Most analyses use a representative sample.

Current water quality monitoring programs for groundwater by source (Agricultural only)

<i>Analyses Performed</i>	<i>Frequency</i>	<i>Concentration Range</i>	<i>Average</i>
None			

As previously stated, the District does not provide groundwater to its growers.

E. Water Uses within the District

1. Agricultural

See Water Inventory Tables, Table 5 - Crop Water Needs

2. Types of irrigation systems used for each crop in current year

<i>Crop name</i>	<i>Total Acres</i>	<i>Level Basin - acres</i>	<i>Furrow - acres</i>	<i>Sprinkler - acres</i>	<i>Low Volume - acres</i>	<i>Multiple methods - acres</i>
Alfalfa	265	265				
Almonds	2147	1288			859	
Carrots	377			377		
Grapes	3498	525			2973	
Oats	300	300				
Pistachios	1085				1085	

3. Urban use by customer type in current year None

<i>Customer Type</i>	<i>Number of Connections</i>	<i>AF</i>
<i>Single-family</i>		
<i>Multi-family</i>		
<i>Commercial</i>		
<i>Industrial</i>		
<i>Institutional</i>		
<i>Landscape irrigation</i>		
<i>Wholesale</i>		
<i>Recycled</i>		
<i>Other (specify)</i>		
<i>Other (specify)</i>		
<i>Other (specify)</i>		
<i>Unaccounted for</i>		
Total		

4. Urban Wastewater Collection/Treatment Systems serving the service area – current year

<i>Treatment Plant</i>	<i>Treatment Level (1, 2, 3)</i>	<i>AF</i>	<i>Disposal to / uses</i>
None			
	Total		
Total discharged to ocean and/or saline sink			

5. Ground water recharge/management in current year (Table 6)

<i>Recharge Area</i>	<i>Method of Recharge</i>	<i>AF</i>	<i>Method of Retrieval</i>
Secara Pond	Percolation	50 acre feet storage capacity	Enhances ground water levels for grower pumping within the District
	Total		

6. Transfers and exchanges into or out of the service area in current year (Table 6)

<i>From Whom</i>	<i>To Whom</i>	<i>AF</i>	<i>Use</i>
Gravelly Ford Water District	Arvin-Edison Water Storage District	1340	Agriculture
GFWD	Chowchilla Water District	60	Agriculture

7. Trades, wheeling, wet/dry year exchanges, banking or other transactions in current year (Table 6)

<i>From Whom</i>	<i>To Whom</i>	<i>AF</i>	<i>Use</i>
None	None		

8. *Other uses of water in current year*

<i>Other Uses</i>	<i>AF</i>
None	

F. Outflow from the District (Agricultural only)

*Districts included in the drainage problem area, as identified in “A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990),” should also complete **Water Inventory Table 7 and Appendix B (include in plan as Attachment L)***

See Facilities Map, Attachment A, for the location of surface and subsurface outflow points, outflow measurement points, outflow water-quality testing locations

1. *Surface and subsurface drain/outflow in current year*

<i>Outflow point</i>	<i>Location description</i>	<i>AF</i>	<i>Type of measurement</i>	<i>Accuracy (%)</i>	<i>% of total outflow</i>	<i>Acres drained</i>
Cottonwood Creek	Avenue 6	0	weir	10	100	100

<i>Outflow point</i>	<i>Where the outflow goes (drain, river or other location)</i>	<i>Type Reuse (if known)</i>
Cottonwood Ck	Irrigation water outflow from District is 0 to 1%	Ag Irrigation
Cottonwood Ck	Flood flow may reach Eastside Bypass	Unknown

2. *Description of the Outflow (surface and subsurface) water quality testing program and the role of each participant in the program*

3. *Outflow (surface drainage & spill) Quality Testing Program*

<i>Analyses Performed</i>	<i>Frequency</i>	<i>Concentration Range</i>	<i>Average</i>	<i>Reuse limitation?</i>
None				

Outflow (subsurface drainage) Quality Testing Program N/A

<i>Analyses Performed</i>	<i>Frequency</i>	<i>Concentration Range</i>	<i>Average</i>	<i>Reuse limitation?</i>
None				

4. Provide a brief discussion of the District's involvement in Central Valley Regional Water Quality Control Board programs or requirements for remediating or monitoring any contaminants that would significantly degrade water quality in the receiving surface waters.

District is a member of the East San Joaquin Water Coalition and the Coalition provides the required testing.

G. Water Accounting (Inventory)

1. Water Supplies Quantified

- a. Surface water supplies, imported and originating within the service area, by month (Table 1)*
- b. Ground water extracted by the district, by month (Table 2)*
- c. Effective precipitation by crop (Table 5)*
- d. Estimated annual ground water extracted by non-district parties (Table 2)*
- e. Recycled urban wastewater, by month (Table 3)*
- f. Other supplies, by month (Table 1)*

2. Water Used Quantified

- a. Agricultural conveyance losses, including seepage, evaporation, and operational spills in canal systems (Table 4) or
Urban leaks, breaks and flushing/fire uses in piped systems (Table 4)*
- b. Consumptive use by riparian vegetation or environmental use (Table 6)*
- c. Applied irrigation water - crop ET, water used for leaching/cultural practices (e.g., frost protection, soil reclamation, etc.) (Table 5)*
- d. Urban water use (Table 6)*
- e. Ground water recharge (Table 6)*
- f. Water exchanges and transfers and out-of-district banking (Table 6)
Estimated deep percolation within the service area (Table 6)*
- h. Flows to perched water table or saline sink (Table 7)*
- i. Outflow water leaving the district (Table 6)*
- j. Other*

3. Overall Water Inventory

- a. Table 6*

H. Assess Quantifiable Objectives:

Identify the Quantifiable Objectives that apply to the District (Planner, chapter 10) and provide a short narrative describing past, present and future plans that address the CALFED Water Use Efficiency Program goals identified for the District.

<i>QO #</i>	<i>QO Description</i>	<i>Past, Present & Future Plans</i>
None		

Section 3: Best Management Practices (BMPs) for Agricultural Contractors

A. Critical Agricultural BMPs

1. Measure the volume of water delivered by the district to each turnout with devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/- 6%

Number of turnouts that are unmeasured or do not meet the standards listed above: 0

Number of measurement devices installed last year: 0

Number of measurement devices installed this year: 0

Number of measurement devices to be installed next year: 1

Types of Measurement Devices Being Installed	Accuracy	Total Installed During Current Year
Flow Meter	±2%	0

2. Designate a water conservation coordinator to develop and implement the Plan and develop progress reports

Name: Don Roberts Title: Manager

Address 18811 Rd 27 Madera CA 93638

Telephone: (559) 474-1000 E-mail: donroberts717@gamil.com

3. Provide or support the availability of water management services to water users
See Attachment J, Notices of District Education Programs and Services Available to Customers.

a. On-Farm Evaluations

- 1) On farm irrigation and drainage system evaluations using a mobile lab type assessment

	Total in district	# surveyed last year	# surveyed in current year	# projected for next year	# projected 2 nd yr in future
Irrigated acres	7672	0	0	0	0
Number of farms	22	0	0	0	0

- 2) Timely field and crop-specific water delivery information to the water user

Send letters to growers to advise of water supply, delivery periods, & costs. Growers are advised of the District's water delivery period, and the cost per acre foot for delivered water. Crop specific water demand is a function of the weather, the crop size, and the soil water retention and soil type for each farm block. The weather information and ET data is ready available from the County Farm Advisors Office, the Department of Water Resources (CIMIS Stations on-line) in Ag-Alert, and local newspapers. The District periodically reminds growers of the sources of available information to assist their decision making.

b. Real-time and normal irrigation scheduling and crop ET information

CIMIS station data for the Madera and Firebaugh areas are available for all growers. Local radio stations as well as local and farm newspaper have information on CIMIS data, crop water use, growing degree days, and soil temperatures or they may access CIMIS directly on line.

c. Surface, ground, and drainage water quantity and quality data provided to water users

Surface supplies are determined each year by precipitation and snow fall in the San Joaquin River watershed. The Friant Waterline newsletter tracks the forecasts through the winter and spring. Final contract quantity is determined by the U.S.B.R. around March 15th. Groundwater elevations are available from the District. The District provides the growers with the water years' surface supply via letters with updates as the District's is changed. The District is small enough that direct contact between the Board members and neighboring growers is a more effective way of communication of information.

d. Agricultural water management educational programs and materials for farmers, staff, and the public

<i>Program</i>	<i>Co-Funders (If Any)</i>	<i>Yearly Targets</i>
Water Symposium (Annual)	Madera County Farm Bureau	Water Users

d. Other

The District has been meeting on regular basis with representatives of other water entities in Madera County to form the Madera Regional Water Management Group to facilitate future coordination, collaboration, and communication for comprehensive management of water resources in the greater Madera County area. A goal of this group will be to implement the Integrated Regional Water Management Plan as adopted by Madera County April 14 2008, and as may be amended from time to time. The District is a member of the RMC San Joaquin River Study Group which is monitoring the San Joaquin River Restoration Settlement program. Under some scenarios, Gravelly Ford could end up with a severely limited or total lack of a Bureau Contract Water Supply. The dues for this membership are \$2,500 per year.

4. *Pricing structure - based at least in part on quantity delivered*

Describe the quantity-based water pricing structure, the cost per acre-foot, and when it became effective.

All delivered water is billed to users based on a per acre foot charge. The charge is set by the Board each year when supplies are known.

5. *Evaluate and describe the need for changes in policies of the institutions to which the district is subject*

With the San Joaquin River restoration program being implemented starting in 2010, the actual available supplies will become less certain due to the unknowns of the restoration program. District is a dues paying member of RMC SJR Study Group.

6. *Evaluate and improve efficiencies of district pumps*

Describe the program to evaluate and improve the efficiencies of the contractor's pumps.

District pumps are serviced annually by a local pump contractor. PG&E provides an annual evaluation of KWH used for each District pump each year which provides a comparative indication of efficiency.

B. Exemptible BMPs for Agricultural Contractors

(See Planner, Chapter 2, Appendix C for examples of exemptible conditions)

1. Facilitate alternative land use

<i>Drainage Characteristic</i>	<i>Acreage</i>	<i>Potential Alternate Uses</i>
<i>High water table (<5 feet)</i>	0	N/A - District does not have irrigable lands with drainage issues, high water table, or poor productivity
<i>Poor drainage</i>	0	
<i>Ground water Selenium concentration > 50 ppb</i>	0	
<i>Poor productivity</i>	0	

Describe how the contractor encourages customers to participate in these programs.

2. Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to crops or soils

<i>Sources of Recycled Urban Waste Water</i>	<i>AF/Y Available</i>	<i>AF/Y Currently Used in District</i>
N/A - District does not have access to a recycled water source.		

3. Facilitate the financing of capital improvements for on-farm irrigation systems

<i>Funding source Programs</i>	<i>How provide assistance</i>
Gravelly Ford Water District	One time offer to pay for 50% of flow meter installation on grower service point. (Currently all farms are drip, micro jet, sprinkler or flood irrigation. There are no open ditches that require piping.

4. Incentive pricing

<i>Structure of incentive pricing</i>	<i>Related goal</i>
N/A - District receives only Class 2 water	

5. a) Line or pipe ditches and canals

<i>Canal/Lateral (Reach)</i>	<i>Type of Improvement</i>	<i>Number of Miles in Reach</i>	<i>Estimated Seepage (AF/Y)</i>	<i>Accomplished/Planned Date</i>

N/A - Based on intermittent and unreliable water supply, it is impractical to line or pipe canals within the distribution system. An almost equal amount of the distribution system is Cottonwood Creek which is an ephemeral stream and cannot be lined or piped.				

b) Construct regulatory reservoirs

<i>Reservoir Name</i>	<i>Annual Spill in Section (AF/Y)</i>	<i>Estimated Spill Recovery (AF/Y)</i>	<i>Accomplished/Planned Date</i>
Secara	2009 No spill	0 for 2009	2006

6. *Increase flexibility in water ordering by, and delivery to, water users*

With an open canal system, the 3 day start notice and the 1 day stop notice is the most practical system for water orders to maximize deliveries and minimize spill.

7. *Construct and operate district spill and tailwater recovery systems*

<i>Distribution System Lateral</i>	<i>Annual Spill (AF/Y)</i>	<i>Quantity Recovered and reused (AF/Y)</i>
Cottonwood Creek Investigation possible diversion structure near end of District to further reduce any spill.	200 Average	200 Recharge Average
Total		

<i>Drainage System Lateral</i>	<i>Annual Drainage Outflow (AF/Y)</i>	<i>Quantity Recovered and reused (AF/Y)</i>
N/A		
Total		

8. Plan to measure outflow.

Total # of outflow (surface) locations/points 2

Total # of outflow (subsurface) locations/points 0

Total # of measured outflow points 2

Percentage of total outflow (volume) measured during report year 100

Identify locations, prioritize, determine best measurement method/cost, submit funding proposal

Location & Priority	Estimated cost (in \$1,000s)				
	2009	2010	2011	2012	2013
Proposed control structure to further reduce possible surface outflow High			15,000		

9. *Optimize conjunctive use of surface and ground water*

District is working with MID to provide joint use of our facilities to assist MID's proposed water bank and provide water delivery to GFWD users on Cottonwood Creek. Bureau currently assesses District a minimum 10% seepage loss in SJR for contract water during low flow periods.

10. *Automate canal structures*

District has 4 structures that are hand operated. It is not cost effective to automate them due to limited and erratic water supply. Gates and weir are maintained annually for optimum operation.

11. *Facilitate or promote water customer pump testing and evaluation*

Pump testing by P.G. & E. is an available option to growers and information regarding this service would be provided to the growers by P.G. & E.'s Agricultural Account Representative. Several private pump companies have advised the District that they no longer provide pump capacity tests as a result of having to go to court too often in disputes.

12. Mapping

GIS maps	Estimated cost (in \$1,000s)				
	2009	2010	2011	2012	2013
Layer 1 – Distribution system	0	1	15,000	10	1
Layer 2 – Drainage system	0	0	0	0	0
Suggested layers:					
Layer 3 – Ground water information			1,000		
Layer 4 – Soils map					
Layer 5 – Natural & cultural resources					
Layer 6 – Problem areas					

C. Provide a 3-Year Budget for Implementing BMPs

1. Amount actually spent during current year.

BMP #	BMP Name	Actual Expenditure (not including staff time)	Staff Hours
A 1	Measurement	\$500	8

	2	Conservation staff	\$0	20
	3	On-farm evaluation /water delivery info	\$0	0
		Irrigation Scheduling	\$0	0
		Water quality	\$100	8
		Agricultural Education Program	\$0	0
	4	Quantity pricing	\$0	0
	5	Policy changes	\$0	0
	6	Contractor's pumps	\$0	0
B	1	Alternative land use	\$0	0
	2	Urban recycled water use	\$0	0
	3	Financing of on-farm improvements	\$0	0
	4	Incentive pricing	\$0	0
	5	Line or pipe canals/install reservoirs	\$0	0
	6	Increase delivery flexibility	\$0	0
	7	District spill/tailwater recovery systems	\$0	0
	8	Measure outflow	\$0	0
	9	Optimize conjunctive use	\$0	0
	10	Automate canal structures	\$0	0
	11	Customer pump testing	\$0	0
	12	Mapping	\$0	0
		<i>Total</i>	\$600	28

2. *Projected budget summary for the next year.*

<i>BMP #</i>	<i>BMP Name</i>	<i>Budgeted Expenditure (not including staff time)</i>	<i>Staff Hours</i>
A 1	Measurement	\$3,000	10
2	Conservation staff	\$0	24
3	On-farm evaluations/water delivery info	\$0	0
	Irrigation Scheduling	\$0	0
	Water quality	\$0	0
	Agricultural Education Program	\$0	0
4	Quantity pricing	\$0	0
5	Policy changes	\$0	0
6	Contractor's pumps	\$0	0
B 1	Alternative land use	\$0	0
2	Urban recycled water use	\$0	0
3	Financing of on-farm improvements	\$0	0
4	Incentive pricing	\$0	0
5	Line or pipe canals/install reservoirs	\$0	0
6	Increase delivery flexibility	\$0	0
7	District spill/tailwater recovery systems	\$15,000	48
8	Measure outflow	\$0	0
9	Optimize conjunctive use	\$0	0
10	Automate canal structures	\$0	0
11	Customer pump testing	\$0	0
12	Mapping	\$0	0
<i>Total</i>		<i>\$18,000</i>	<i>82</i>

3. *Projected budget summary for 3rd year.*

<i>BMP #</i>	<i>BMP Name</i>	<i>Budgeted Expenditure (not including staff time)</i>	<i>Staff Hours</i>
A 1	Measurement	\$0	0
2	Conservation staff	\$0	24
3	On-farm evaluations/water delivery info	\$0	0
	Irrigation Scheduling	\$0	0
	Water quality	\$2,000	40
	Agricultural Education Program	\$0	0
4	Quantity pricing	\$0	0
5	Policy changes	\$0	0
6	Contractor's pumps	\$0	0

(continued)

<i>BMP #</i>	<i>BMP Name</i>	<i>Budgeted Expenditure (not including staff time)</i>	<i>Staff Hours</i>
<i>B 1</i>	<i>Alternative land use</i>	\$0	0
<i>2</i>	<i>Urban recycled water use</i>	\$0	0
<i>3</i>	<i>Financing of on-farm improvements</i>	\$0	0
<i>4</i>	<i>Incentive pricing</i>	\$0	0
<i>5</i>	<i>Line or pipe canals/install reservoirs</i>	\$0	0
<i>6</i>	<i>Increase delivery flexibility</i>	\$0	0
<i>7</i>	<i>District spill/tailwater recovery systems</i>	\$10,000	100
<i>8</i>	<i>Measure outflow</i>	\$0	0
<i>9</i>	<i>Optimize conjunctive use</i>	\$0	0
<i>10</i>	<i>Automate canal structures</i>	\$0	0
<i>11</i>	<i>Customer pump testing</i>	\$0	0
<i>12</i>	<i>Mapping</i>	\$1,000	20
	<i>Total</i>	\$13,000	184

Year of Data **Enter data year here**

Table 1

Surface Water Supply

2009 Month	Federal Ag Water (acre-feet)	Federal non- Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (acre-feet)	M.I.D. (acre-feet)	Drain Water (acre-feet)	Total (acre-feet)
Method	M-1			M-3	M-1		
January	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0
April	0	0	0	0	0	0	0
May	1343	0	0	0	301	0	1,644
June	358	0	0	0	85	0	443
July	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0
TOTAL	1,701	0	0	0	386	0	2,087

Table 2

Ground Water Supply

2009 Month	Groundwater r (acre-feet)	Groundwater r *(acre-feet)
Method		
January	0	0
February	0	0
March	0	700
April	0	1,500
May	0	3,000
June	0	4,700
July	0	5,500
August	0	4,700
September	0	3,300
October	0	1,200
November	0	0
December	0	0
TOTAL	0	24,600

*normally estimated

Table 3***Total Water Supply***

2009 Month	Surface Water Total (acre-feet)	Groundwater r (acre-feet)	M&I Wastewater (acre-feet)	District Water (acre-feet)
Method				
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	1,644	0	0	1,644
June	443	0	0	443
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0
October	0	0	0	0
November	0	0	0	0
December	0	0	0	0
TOTAL	2,087	0	0	2,087

*Recycled M&I Wastewater is treated urban wastewater that is used for agriculture.

Table 4***Distribution System***

2009								
Canal, Pipeline, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	precipitation (acre-feet)	Evaporation (acre-feet)	Spillage (acre-feet)	Seepage (acre-feet)	Total (acre-feet)
GFC SJR/Ave7	22,500	40	900,000	14	151	0	496	(633)
GFC Ave7/CWC	4,000	20	80,000	1	13	0	31	(43)
CWC Rd20/CWC	6,600	30	198,000	3	33	0	73	(103)
CWC Rd19/Rd191	2,600	20	52,000	1	9	0	19	(27)
GFC CWC/ElPeco	5,300	15	79,500	1	13	0	29	(41)
GFC ElPecoNorth	5,700	60	342,000	5	57	0	126	(178)
CWC GFC/ElPeco	3,900	25	97,500	1	16	0	36	(51)
CWC ElPeco/Ave7	3,200	20	64,000	1	11	0	24	(33)
CWC Ave7/Ave6	10,700	20	214,000	3	36	0	79	(111)
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
TOTAL			2,027,000	31	339	0	912	603

Table 5

Crop Water Needs

2009 Crop Name	Area (crop acres)	Crop ET (AF/Ac)	Leaching Requiremen (AF/Ac)	Cultural Practices (AF/Ac)	Effective Precipitatio (AF/Ac)	Appl. Crop Water Use (acre-feet)
Alfalfa	265	4.60	0.00	0.00	0.14	1,182
Almonds	2,147	3.50	0.00	0.21	0.14	7,665
Carrots	377	3.00	0.00	0.00	0.10	1,093
Grapes	3,498	2.50	0.00	0.00	0.10	8,395
Oats	300	1.50	0.00	0.00	0.10	420
Pistachios	1,085	3.10	0.00	0.00	0.14	3,212
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
Crop Acres	7,672					21,967

Total Irrig. Acres 7,672 (If this number is larger than your known total, it may be due to double cropping)

Table 6**2009 District Water Inventory**

Water Supply	Table 3		2,087
Riparian ET	(Distribution and Drain)	minus	150
Groundwater recharge	intentional - ponds, injection	minus	0
Seepage	Table 4	minus	912
Evaporation - Precipitation	Table 4	minus	308
Spillage	Table 4	minus	0
Transfers/exchanges/trades/wheel (into or out of the district)		plus/minus	0
Non-Agri deliveries	delivered to non-ag customer	minus	0
Water Available for sale to agricultural customers			717
<i>Compare the above line with the next line to help find data gaps</i>			
<u>2005 Actual Agricultural Water Sales</u>	From District Sales Records		717
Private Groundwater	Table 2	plus	24,600
Crop Water Needs	Table 5	minus	21,967
Drainwater outflow	(tail and tile not recycled)	minus	0
Percolation from Agricultural Land	(calculated)		3,350

Table 7

Influence on Groundwater and Saline Sink

2009

Agric Land Deep Perc + Seepage + Recharge - Groundwater Pumping = District Influence	912
Estimated actual change in ground water storage, including natural recharge)	0
Irrigated Acres (from Table 5)	7,672
Irrigated acres over a perched water table	0
Irrigated acres draining to a saline sink	0
Portion of percolation from agri seeping to a perched water table	0
Portion of percolation from agri seeping to a saline sink	0
Portion of On-Farm Drain water flowing to a perched water table/saline sink	0
Portion of Dist. Sys. seep/leaks/spills to perched water table/saline sink	0
Total (AF) flowing to a perched water table and saline sink	0

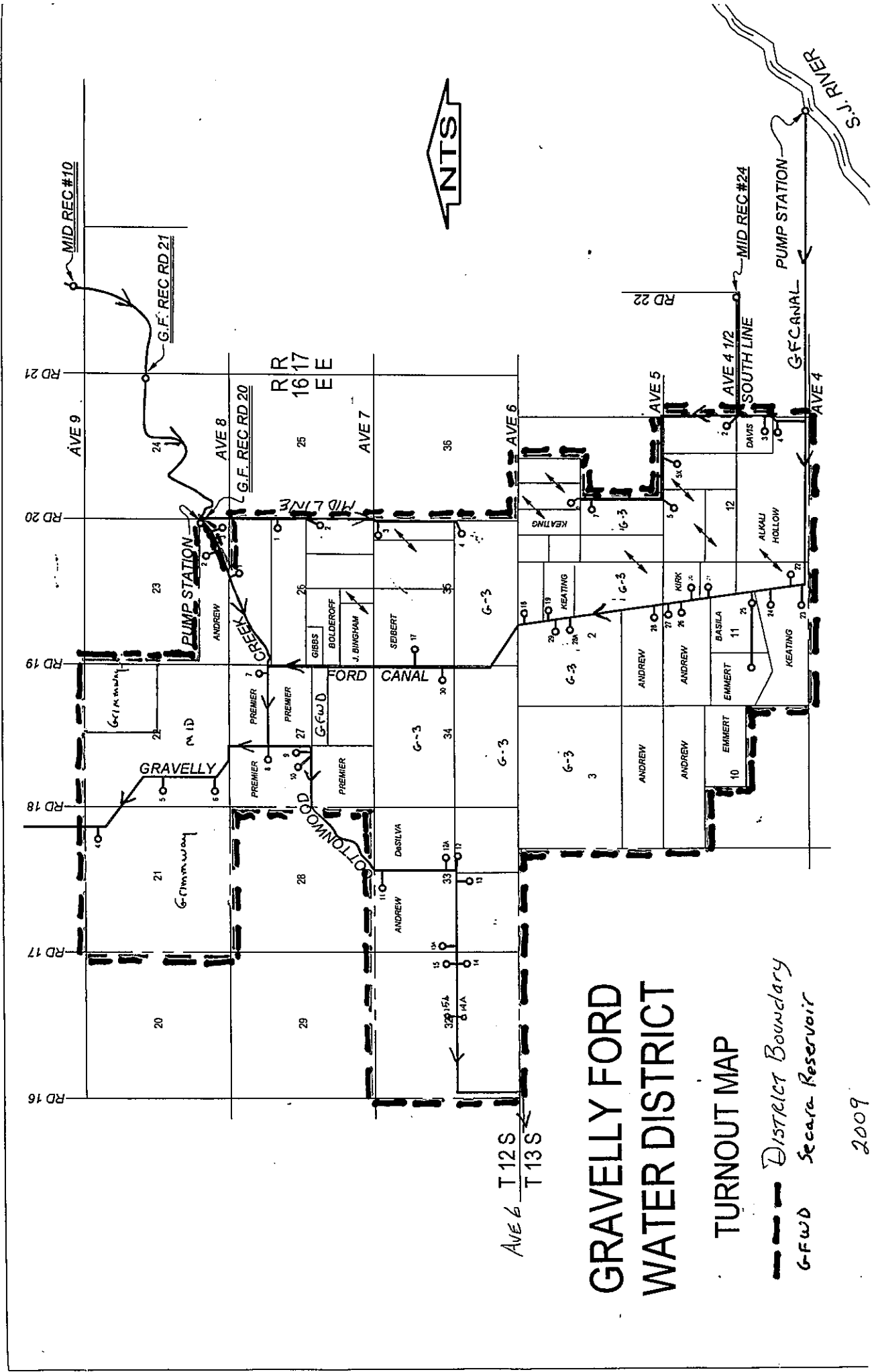
Table 8

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal Ag Water (acre-feet)	Federal non- Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (acre-feet)	M.I.D. (acre-feet)	Drain Water (acre-feet)	Total (acre-feet)
2000	8,005	0	0	3,417	800	0	12,222
2001	3,707	0	0	120	150	0	3,977
2002	6,082	0	0	1,037	1,975	0	9,094
2003	8,444	0	0	1,708	1,854	0	12,006
2004	5,350	0	0	1,112	1,177	0	7,639
2005	9,061	0	0	2,133	1,608	0	12,802
2006	7,911	0	0	1,755	1,901	0	11,567
2007	5,015	0	0	399	796	0	6,210
2008	4,233	0	0	665	937	0	5,835
2009	1,701	0	0	0	386	0	2,087
Total	59,509	0	0	12,346	11,584	0	83,439
Average	5,951	0	0	1,235	1,158	0	8,344

ATTACHMENT

A



ATTACHMENT

B

Columbia-Temple association.

HE BASIN AREA.

Fresno-El Peco-Pozo association.

Fresno-El Peco association.

Dinuba-El Peco association.

Traver-Chino association.

10

Daulton-Whiterock association.

11

Ahwahnee-Vista association.

12

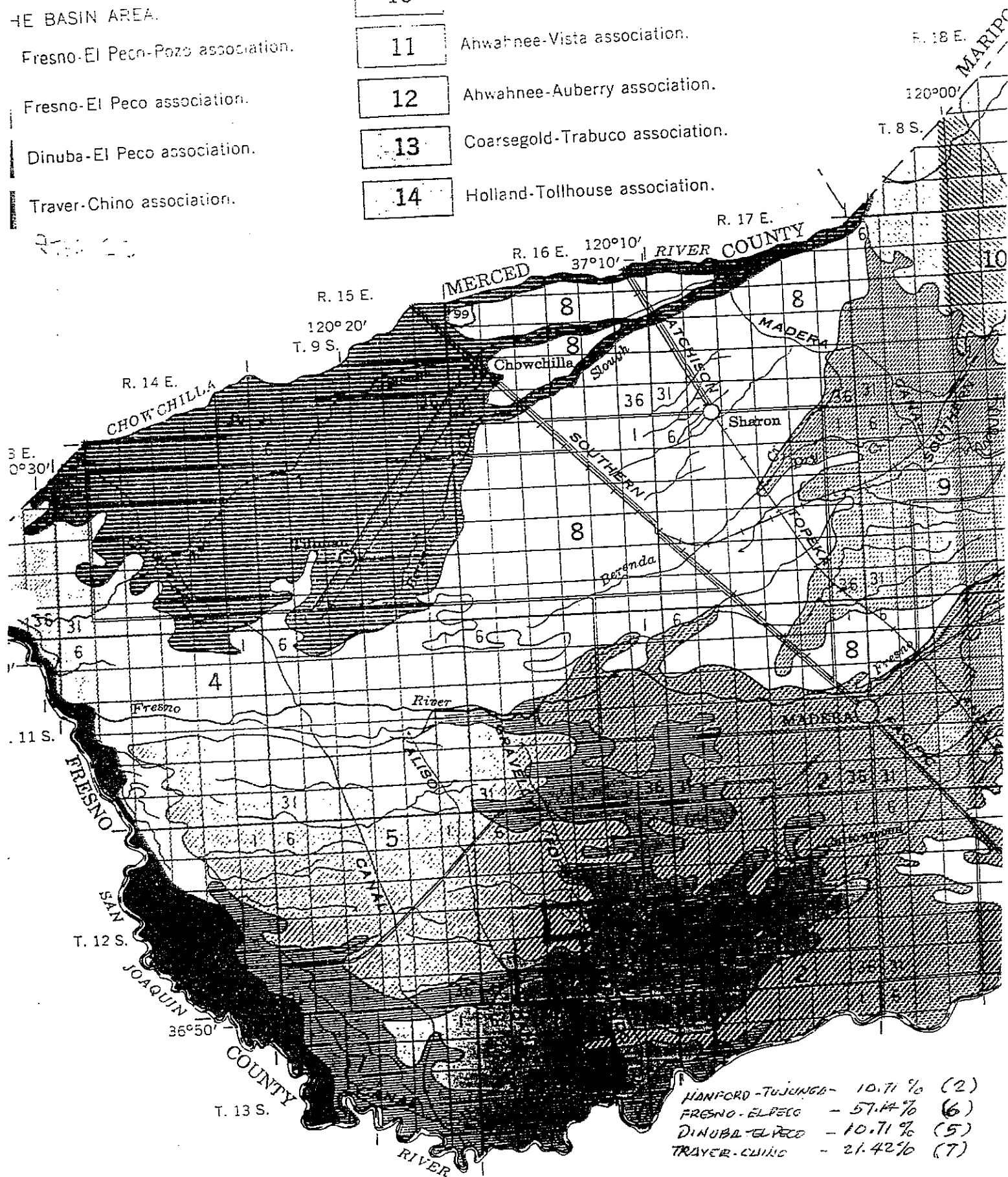
Ahwahnee-Auberry association.

13

Coarsegold-Trabuco association.

14

Holland-Tollhouse association.



HANFORD-TUJUNGA - 10.71% (2)
 FRESNO-ELPECO - 57.14% (6)
 DINUBA-ELPECO - 10.71% (5)
 TRAYER-CHINO - 21.42% (7)

SOIL SURVEY OF MADERA AREA, CALIFORNIA

SOILS SURVEYED BY LESLIE K. STROMBERG, IN CHARGE, GORDON L. HUNTINGTON, AND EUGENE L. BEGG, CALIFORNIA AGRICULTURAL EXPERIMENT STATION; AND GEORGE K. SMITH, UNITED STATES DEPARTMENT OF AGRICULTURE

REPORT BY RUDOLPH ULRICH, UNITED STATES DEPARTMENT OF AGRICULTURE, AND LESLIE K. STROMBERG, UNIVERSITY OF CALIFORNIA

UNITED STATES DEPARTMENT OF AGRICULTURE AND THE CALIFORNIA AGRICULTURAL EXPERIMENT STATION

THE MADERA AREA consists of the western two-thirds of Madera County. The county is in the geographical center of California and occupies part of the eastern side of the San Joaquin Valley and the western slope of the Sierra Nevada (fig. 1). Madera County is

135 miles southeast of Sacramento, and 21 miles northwest of Fresno.

The total area of the county is approximately 2,148 square miles (1,374,720 acres). Of this, 810 square miles is valley land, 540 square miles is foothill land, and 794 square miles is mountainous land. The valley was surveyed in detail, the foothills in semi-detail, and the mountains in reconnaissance. Only the valley and the foothills are shown on the maps in this report, and only the soils in those parts of the county are described in detail.

Soil Associations

The association of two or more soils in a repeating pattern makes it possible to generalize about the soils of an area and to emphasize one or more outstanding things. Thus, important problems may be highlighted, such as restricted drainage, excess salts or alkali, gravelly or stony materials, or shallowness over claypan, hardpan, or bedrock. Many of these problems are difficult for an individual to deal with, and they are frequently a basis for group action, such as the formation of an irrigation, drainage, or soil conservation district.

There are 14 soil associations in the Madera Area. The colored map at the back of this report, just ahead of the detailed soil map, shows the extent and distribution of each of these important patterns of soils. The Area naturally divides into four major parts. From west to east, and generally increasing in elevation, these four parts are (1) the recent alluvial fans and flood plains, (2) the basin area, (3) the older alluvial fans and terraces, and (4) the uplands. In the first of these parts there are three soil associations, in the second, four soil associations, in the third, two soil associations, and in the fourth, five soil associations. Each major part and each association is described in the following pages.

Soils of the Recent Alluvial Fans and Flood Plains

The recent alluvial fans and flood plains form the nearly level and very gently sloping areas along the drainageways. The elevation ranges from 110 to 400 feet.

The alluvial fans are cone-shaped and slope gently upward toward the uplands. The major fans are those

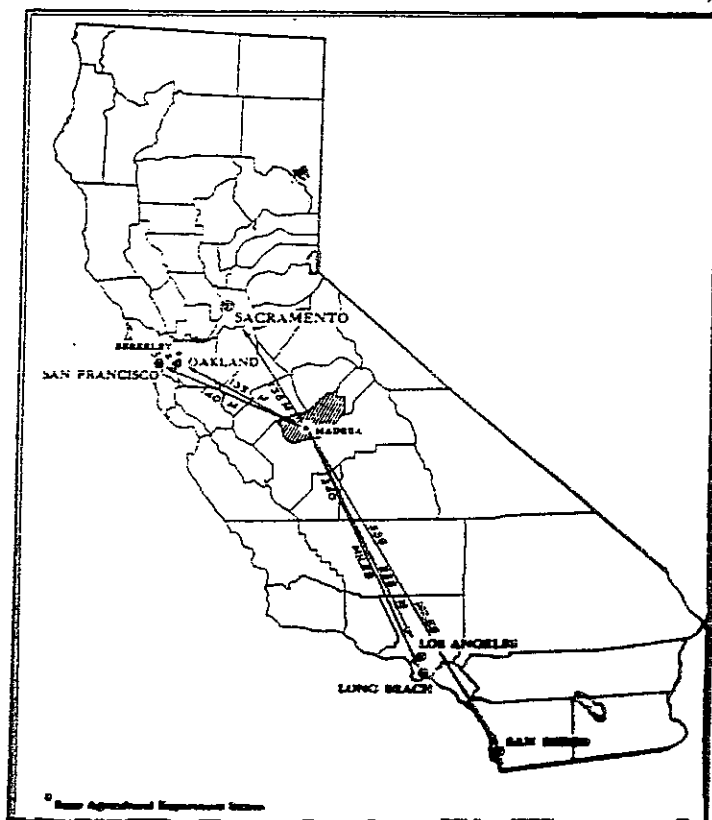


Figure 1.—Location of Madera Area in California.

bounded on the northwest by the Chowchilla River and Mariposa County; on the west, south, and southeast by the San Joaquin River; and on the east by Mono County. The boundary between Mono and Madera Counties is at the crest of the Sierra Nevada. Madera, the county seat and the largest city, is in the west-central part of the county. It is 140 miles east-southeast of San Francisco,

of the Chowchilla and Fresno Rivers. Only the northern edge of the San Joaquin River fan is in the Madera Area.

Along most of its course, the flood plain of the San Joaquin River is narrow. Flooding is now well controlled by Friant Dam.

The three soil associations in this part of the Area are the following:

1. Pachappa-Grangeville, composed of slightly calcareous, nonsaline and nonalkali to slightly saline-alkali, well-drained, stratified, moderately coarse textured and medium textured soils.

2. Hanford-Tujunga, composed of noncalcareous, nonsaline and nonalkali, well drained and somewhat excessively drained, moderately coarse textured and coarse textured soils.

3. Columbia-Temple, composed of noncalcareous to strongly calcareous, nonsaline-alkali or slightly saline-alkali, imperfectly drained, moderately coarse textured to moderately fine textured soils.

1. Pachappa-Grangeville soil association

This association dominates the Chowchilla River fan in the northwestern part of the Madera Area. There is much variation in the soils within short distances because of stream deposition and stratification. Thin, recent deposits on top of older soil materials are common. As a result of widespread pump irrigation, the soils are now mostly well drained, but much of the acreage was imperfectly drained in the past.

Pachappa and Grangeville soils dominate the association, but Traver, Chino, Fresno, Hanford, and Tujunga soils are also important. The Pachappa soils are brownish sandy loams overlying slightly finer textured, moderately calcareous subsoils. They are slightly saline-alkali in many places. The Grangeville soils are grayish brown and are moderately coarse textured throughout. The subsoil and substratum contain slight amounts of lime and are somewhat mottled. Slight amounts of salts and alkali, mostly in the subsoil and substratum, are also common.

The Traver, Chino, and Fresno soils are between drainageways. For the most part, these soils contain more lime than the Pachappa and Grangeville soils, are more strongly saline-alkali, and are imperfectly drained. The Hanford and Tujunga soils along the drainageways are moderately coarse to coarse in texture, uniform throughout, noncalcareous, and nonsaline and nonalkali.

Shallow-rooted, lime-, salt-, and alkali-tolerant crops are best for these soils. Cotton, alfalfa, small grain, forage crops, and irrigated pasture are the best suited crops. Deep-rooted, normally long-lived crops and crops sensitive to lime, salts, and alkali are likely to be short-lived and uneven in appearance and are unlikely to produce satisfactory yields.

2. Hanford-Tujunga soil association

This association dominates the Fresno and San Joaquin River fans in the south-central part of the Madera Area. Relatively deep and uniform deposits of alluvium derived largely from granitic rocks characterize the area. Natural drainage is good to somewhat excessive. The water table is now well below its former level, as a result of pump irrigation.

On the Fresno River fan Hanford soils dominate, and winding, narrow stringers of coarse-textured Tujunga soils occupy the old stream channels. The San Joaquin River fan is similar, except that an unrelated substratum high in silt underlies the Hanford soils at moderate depths. Cottonwood Creek marks the approximate boundary between the Fresno River fan and the San Joaquin River fan and between the two major variations in the Hanford soils.

The Hanford soils are pale brown, noncalcareous, and moderately coarse textured. Typically, they are very deep, except where underlain by the unrelated silty substrata. The Tujunga soils are much like the Hanford soils in appearance, but they were derived from coarse-textured materials and are much lower in fertility, water-holding capacity, and organic matter. Typically, moisture moves very rapidly through the Tujunga soils.

The minor soils in this association include the Greenfield, Traver, Chino, Atwater, Grangeville, San Joaquin, and Madera soils. The Greenfield soils are the most important of the included soils. They are similar to the Hanford soils but occupy older and slightly higher terraces, chiefly along the Fresno River, and they have slightly more clay in the subsoil than in the surface soil.

The soils of this association are well suited to a wide range of crops, and they could be intensively used for many crops in addition to those now commonly grown. Deep-rooted, long-lived crops grow well, especially on the Fresno River fan. Somewhat more careful management is required on the San Joaquin River fan, because of the silty substratum. On the Fresno River fan, the most common crops are cotton, alfalfa, small grain, and pasture, and there are small acreages of fruit and nut crops. Grapes are the main crop on the San Joaquin River fan.

Most of the problems of managing the soils in this association result from the contrast in fertility and in water requirements between the Hanford and Tujunga soils.

3. Columbia-Temple soil association

This association occurs along the San Joaquin River flood plain on the western edge of Madera County. The natural drainage was imperfect to poor. Floods occurred almost every year until Friant Dam, further up the San Joaquin River, was built. Pine Flat Dam, on the Kings River in Fresno County, similarly controls floodwaters that enter the San Joaquin River from Fresno Slough at the southwestern corner of the county. Intensive pump irrigation has lowered the water table, and most of this association now has improved surface and subsurface drainage.

Columbia and Temple soils dominate; Foster and Chino soils are also important. The Columbia soils are pale brown, noncalcareous, and moderately coarse textured throughout. They show little change with increasing depth, except for variable mottling in the subsoil and substratum. Generally they are close to the river. The Temple soils are farther from the river, where the movement of water was slower and the finer textured sediments were deposited. The Temple soils are dark colored, mottled, and medium textured to moderately fine textured. They are strongly calcareous in

the subsoil. In many places they are slightly saline.

Because of the generally imperfect drainage, the lime content, and excess salts and alkali, the best crops for the soils in this association are shallow-rooted, short-lived forage, pasture, row, and grain crops. Alfalfa, cotton, sugar beets, and small grains are the most common crops. Deep-rooted, long-lived crops, such as orchard crops, are not well suited. Temporary or perched water tables, caused by overirrigation or lateral movement of water from higher areas, present serious management problems. Problems caused by excess salts and alkali are also locally important.

Soils of the Basin Area

The basin includes the older alluvial deposits in the western part of the Madera Area. The relief is nearly level to very gently undulating, and the entire area slopes downward very gently from the east toward the west. The elevation ranges from 125 feet to about 165 feet.

This area was probably at the lower end of older alluvial fans, and it received the finer textured, water-transported sediments. Much water-soluble material in the form of lime and soluble salts was also deposited. Wind-eroded, shallow, intermittent streams are common, and the pattern of soils is closely related to them.

The four soil associations in this part of the Area are the following:

4. Fresno-El Peco-Pozo, composed of slightly to strongly calcareous, slightly to strongly saline-alkali soils that have a light-colored or dark-colored surface soil and are shallow to moderately deep over a lime-silica hardpan.

5. Fresno-El Peco, composed of slightly to strongly calcareous, slightly to strongly saline-alkali soils that have a light-colored surface soil and are shallow to moderately deep over a lime-silica hardpan.

6. Dinuba-El Peco, composed of slightly calcareous, nonsaline and nonalkali to strongly saline-alkali soils that have a light-colored surface soil, an unrelated silty substratum, and, in places, a thin lime-silica hardpan at a moderate depth.

7. Traver-Chino, composed of slightly to moderately calcareous, nonsaline and nonalkali to strongly saline-alkali soils that have a light-colored or dark-colored surface soil and a subsoil of slightly higher clay content.

4. Fresno-El Peco-Pozo soil association

This association occurs in the northwestern part of the Madera Area. It extends from just south of the Fresno River to the northwestern corner of the Area. It is generally south and west of the Chowchilla River alluvial fan, which is in the Pachappa-Grangeville association. Surface drainage is slow, and, because of the lime-silica hardpan in the subsoil, internal drainage is very slow. General drainage is imperfect, although the water table is now well below its former level because of widespread pump irrigation.

The distinctive characteristic of this association is the contrast between the dark-colored surface horizon of the Pozo soils and the light-colored surface horizon of the Fresno and El Peco soils. There are also differences in microrelief. The Pozo soils are generally in swales or

low places along shallow watercourses, and the Fresno and El Peco soils are on slightly higher areas between waterways. The organic-matter content of the Pozo soils is high, but the Fresno and El Peco soils are low to very low in organic matter. Salts and alkali, especially in the surface soil, are less strong in the Pozo soils than in the Fresno and El Peco soils. The presence of a horizon of moderate clay content in the subsoil of the Fresno soils and in the El Peco soils is the principal difference between these two series.

Range has been the principal use of this association until recently, because of the excess salts and alkali and the hardpan. Flooding with surplus surface water diverted by levees increased forage production somewhat. Limited areas were reclaimed; most of these are where the salt and alkali concentrations are least strong. Reclaimed areas are used for irrigated pasture, forage, and grain crops. Until recently, reclamation was limited mainly to removing the excess salts and alkali from the surface soil and planting salt- and alkali-tolerant crops and pasture plants. Little effort was made to break the hardpan or to remove salts and alkali from the subsoil.

There have been two recent developments. The first has been to locate and improve the dark-colored Pozo soils. Improvement has been mostly a matter of leveling the surface to prepare for pump irrigation and planting cotton, forage crops, and pasture. Little if any effort has been made to remove salts and alkali. The second development has been the improvement of the Fresno and El Peco soils by leveling, deep chiseling, and the application of gypsum and other amendments to reduce the accumulation of salts and alkali, improve permeability, and disrupt the hardpan. After improvement, these soils are used mostly for irrigated pasture and forage crops.

5. Fresno-El Peco soil association

This association occurs in the southwestern part of the Area, south of the Fresno River. It is similar to association 4 except that no Pozo soils are present (fig. 2).



Figure 2.—Fresno and El Peco fine sandy loams, strongly saline-alkali, 0 to 1 percent slopes, in the Fresno-El Peco soil association.

Range is the predominant use. The soils are being improved in the same way as the Fresno and El Peco soils in association 4.

6. Dinuba-El Peco soil association

This association occurs in the southwestern part of the Area. It is bordered on the northwest by the Fresno-

El Peco association, and the two associations have many similarities.

The distinctive feature of association 6 is the presence of unrelated silty sediments in the substratum of the Dinuba and El Peco soils. The principal difference between the two soils is that the upper part of this unrelated substratum is cemented with lime and silica in the El Peco soils but not in the Dinuba soils. The Dinuba soils have slightly more clay in the subsoil than in the surface soil, but the El Peco soils are relatively uniform down to the hardpan. The silty substratum or hardpan is usually at a moderate depth. Slight to moderate amounts of excess salts and alkali are present; local areas are strongly affected. Drainage is moderately good to imperfect; internal drainage is slow to very slow.

Irrigated row, forage, grain, and pasture crops are the common crops; grapes are also important on the nonsaline and nonalkali areas. Range is the principal use for the areas where the concentrations of salts and alkali are strong. Reclamation ordinarily requires the use of gypsum and other amendments, deep leaching, and in places deep chiseling to improve water penetration and to disrupt the hardpan.

7. *Traver-Chino soil association*

This association occurs in two large tracts, one east of the Fresno-El Peco and Dinuba-El Peco soil associations and the other along the San Joaquin River in the southwestern part of the Area. General drainage is good to imperfect. Pumping for irrigation has lowered the water table.

Traver and Chino soils are dominant, and some Dinuba, Fresno, and Wunjei soils are also included. The Traver soils are light colored and moderately coarse textured to medium textured. They have slightly more clay in the subsoil than in the surface soil. The Chino soils are similar but have a dark-colored surface soil, slightly more clay in the subsoil, and a moderately calcareous lower subsoil. Concentrations of salts and alkali vary from slight to strong; the Traver soils are generally the more strongly affected. Some parts of the association are free of excess salts and alkali.

Irrigated row, forage, pasture, and grain crops are commonly grown on the soils less strongly affected by salts and alkali. Strongly affected areas are mostly in range. Deep-rooted tree crops are poorly suited. Reclamation by periodic deep leaching and the application of gypsum and other amendments is usually feasible.

Soils of the Older Alluvial Fans and Terraces

The older alluvial fans and terraces include gently sloping to rolling and hilly areas that have not received fresh deposits of alluvium for a long time. They generally occupy benches or terraces and are rarely if ever flooded. Some areas are so strongly sloping that they are subject to stream cutting and erosion. The elevation ranges from 180 to about 500 feet.

Many changes have occurred in these older alluvial deposits and in the soils formed from them. The distinguishing differences among the soils depend on how stable the surface has been.

The two associations in this part of the Area are the following:

8. San Joaquin-Madera, composed of brownish to reddish-yellow soils that have a claypan subsoil over an indurated iron-silica hardpan.

9. Cometa-Whitney, composed of brownish to reddish-brown soils that have slight to large amounts of clay in the subsoil and lack an iron-silica hardpan.

8. *San Joaquin-Madera soil association*

This association occurs in the northern and south-central parts of the Area. It is most extensive on the old Chowchilla River fan, in the north, and dominates in much of the area between Chowchilla and Madera. The San Joaquin River fan, in the south, is somewhat less extensive.

The surface conforms to the slope of the old alluvial fan deposits from which the soils in this association were derived. The areas slope gently upward from west to east, and the relief is undulating or hogwallowed.

The San Joaquin and Madera soils differ mainly in color, reaction, and natural fertility. These differences are not marked, nor are they especially important, because the very slowly permeable claypan-hardpan subsoil, comparatively near the surface, is the striking characteristic of these soils and dominates in determining their use and management.

Except where irrigated, this association is used mainly for dryfarmed small grain or for range. Yields of dryfarmed crops are rather low, primarily because of low rainfall, restricted rooting depth, low fertility, and low water-holding capacity. Some of the lower tracts, mostly in the western part of the Area where the pumping lift is not excessive, have been leveled and are used mostly for irrigated pasture. If properly fertilized, irrigated, and seeded to suitable grasses and legumes, the pastures are productive. Disrupting the hardpan by the use of heavy equipment or by blasting has not been extensively attempted. More intensive use depends largely on obtaining additional water, and the pumping lift makes this a serious problem in much of this association.

9. *Cometa-Whitney soil association*

This association dominates in the central part of the older alluvial fans. In a general way it centers along the Fresno River. Relief is generally more pronounced than in association 8; slopes are stronger and more irregular, and more stream dissection has taken place (fig. 3).

On the gentler slopes, where soil development has more than kept pace with soil removal, the brown to reddish-brown Cometa soils, which have a claypan subsoil at a moderate depth, occur extensively. On the stronger slopes, where surface dissection has been active, are the brownish Whitney soils, which have only a slight accumulation of clay in the subsoil.

This association, like the San Joaquin-Madera, is used mainly for dryfarmed grain or for range. The Cometa soils are used and managed in much the same way as the San Joaquin and Madera soils; the claypan in the Cometa soils is about as restrictive as the claypan-hardpan combination in the San Joaquin and Madera soils.

ATTACHMENT

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GRAVELY FORD WATER DISTRICT

RULES AND REGULATIONS FOR
DISTRIBUTION OF WATER
AND
MAINTENANCE OF THE SYSTEM

GRAVELY FORD WATER DISTRICT

RULES AND REGULATIONS FOR DISTRIBUTION OF WATER AND MAINTENANCE OF THE SYSTEM

PLEASE NOTE THAT THESE RULES ARE SIMILAR TO THOSE OF MADERA IRRIGATION DISTRICT, BUT THERE ARE CHANGES AND VARIATIONS. READ THESE RULES CAREFULLY.

DEFINITIONS

As used in these rules,

"Authorized agents" includes Gravelly Ford Water District officers and employees;

"Board" means Board of Directors of the Gravelly Ford Water District;

"District" means GRAVELY FORD WATER DISTRICT;

"Water user" means the landowner or lessee using water provided by Gravelly Ford Water District;

RULE 1

CONTRACTS WITH THE UNITED STATES

1.1 All water distributed by the District which has been furnished to the District by the United States pursuant to contracts between the United States and the District shall be subject to such restrictions and on such terms and conditions as are required by the provisions of said contracts and the reclamation laws of the United States.

RULE 2

OPERATION AND CONTROL OF DISTRICT WORKS

2.1 All diversion works, canals, ditches, headgates, pipelines, and other structures belonging to the District will be operated and maintained by the District and the control and operation will be under the authorized agents of the District. The location and number of gates for the distribution of water from the District's canals and the manner of delivery therefrom shall be determined by the Board.

RULE 3

ACCESS TO LANDS

3.1 The authorized agents or employees of the District shall have free access at all times to all lands irrigated from the District system for the purpose of maintaining, or examining the ditches and the flow of water therein and for the purpose of ascertaining the acreage of crops on lands irrigated or to be irrigated.

3.2 If the District holds a right of way or easement across private land for the operation of a canal or other facility, the law provides that the District shall have certain secondary rights and easements, such as the right to enter property upon which the right of way or easement is located to make repairs or do such other things as are necessary for the full exercise of the easement rights.

RULE 4

BASIS FOR ALLOCATION OF WATER

4.1 Each water user shall be entitled to an allocated quantity of water which shall be fixed annually by the Board, and shall pay the charge levied thereon whether or not the allocation is ordered and/or used.

4.2 In the event that during any irrigation season there is anticipated or actual shortage of water, the District will equitably distribute the available supply among the water users in such manner as the Board shall determine.

4.3 In making such distribution, the District may, among other things, reduce the length of time of District water delivered or the amount or quantity of water delivered during any period of District service.

4.4 In the event that during any irrigation season there is anticipated or actual oversupply of water, an additional water allocation may be imposed on all irrigable lands of the District when the same is deemed necessary by the Board. This additional water allocation shall have a charge levied upon it whether or not water is ordered or used. The water allocation shall entitle the water user to a specified amount of water.

4.5 When, in the opinion of the District, water demands exceed either the design or capacity of the service ditch or pipeline or the supply of water, the District reserves the right to rotate the use of water by basic time and quantity method, when notified by the District.

RULE 5

APPLICATIONS FOR WATER SERVICE

5.1 The normal irrigation season shall commence on March 1 and end on September 15 of any year.

5.2 No application for water will be accepted until all unpaid water assessment balances are satisfied.

5.3 All applications shall state the amount of water being applied for, a property description or assessor's parcel number, and the acreage to be served. Applications must be signed by owners of record for the land to be irrigated as shown on the assessment rolls of Madera County, or upon such other proof as is acceptable to the District. Tenants or buyers under conditional sales contracts must obtain written approval for such application from the owner of record within thirty (30) days after submission of the application to the District. The District reserves the right to impose a uniform per acre deposit for all water ordered pursuant to this Rule.

5.4 The period for making application for mandatory allocations shall be from the fourth Monday of February through and included the last regular business day of March at 5:00 P.M. of each year. Applications shall be filed in the District Office or at such places designated by the District on forms provided by the District.

5.5 Any applications filed after the closing date will be subject, at the option of the District, to late charges which shall be fixed from time to time by the Board and to the availability of water. Delivery of this water will be made in such manner so as not to interfere with deliveries made for applications made within the regular application period.

5.6 In the event the total demand for water exceeds the amount available, the supply shall be prorated among the applicants who filed during the regular filing period.

RULE 6

NOTICE AND METHOD OF DELIVERIES

6.1 No water will be delivered until delinquent water balances are paid on the parcel for which application is made. Water charge balances are delinquent when unpaid for more than 30 days from the billing date.

6.2 The Gravelly Ford Water District shall be notified not less than three (3) days in advance of the time water is to be delivered and at least 24 hours prior to turning water off. t
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6.3 If water is available, it may be delivered earlier than three (3) days, provided deliveries can be made without interference to other water users and without undue waste of water.

Hours for Ordering Water on and Off

6.4 All orders shall be placed with Gravelly Ford Water District's ditchtender between 6:00 a.m. and 6:00 p.m. 7 days a week.

Phone: 706-4892

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6.5 Water must be used continuously day and night for a minimum period of 24 hours, or until irrigation is completed. Charges shall be made according to this Rule.

6.6 Users terminating irrigations on weekends and requiring water again on Monday will be charged on a continuous service basis.

6.7 A minimum flow of one (1) cubic foot per second (cfs) or 450 gallons per minute (gpm) may be imposed at any delivery point when the District deems this necessary.

6.8 All deliveries through headgate structures shall be controlled by the ditchtender who may lock these gates open or shut. The ditchtender shall be notified to make any changes.

6.9 If the ditch or other water user-owned distribution system is in such condition that a usable amount of water cannot be delivered, delivery may be refused until such condition is remedied.

6.10 When the distribution system or any part is at capacity and there is a waiting list of water users who have not served their mandatory allocation, any water user on this system who is using an amount above the mandatory allocation may be directed, upon 24 hours notice, to terminate service to provide water for other water users with a balance remaining on their mandatory allocation.

6.11 The District reserves the right to rotate the use of water by the basic time and quantity method.

RULE 7

WATER CHARGES

7.1 As provided on the application, charges for water shall be payable to "GRAVELLY FORD WATER DISTRICT" when payment is made by check and shall be payable at the office of the District at 1836 West Fifth Street, Madera, California 93637. Payments delivered by mail should be addressed as follows: Gravelly Ford Water District, c/o 1836 West Fifth Street, Madera, CA 93637.

7.2 All water charges are due and payable thirty (30) days after billing. All such charges not paid by this date are delinquent. Water charges not paid within the time required by these rules will be charged interest at the rate of 1.5% per month (18% per year).

7.3 Charges for any mandatory allocation of water not used during the prior water season shall remain as an encumbrance against the parcel. On October 10 of the year in which water is used, if water usage and/or mandatory water allocation charges remain, charges will be applied first to the first installment of assessments and become part of the assessment.

7.4 If payment is not made by December 20 of that year, unpaid water charges will subject to a ten percent (10%) penalty. This charge as well as the unpaid charges shall constitute a lien against the property on which water was used or allocated.

RULE 8

WATER TRANSFER AND RELEASE

8.1 Application for transfer or release of surplus crop water may be made to the Gravelly Ford Water District in the year in which it is ordered or allocated, unless otherwise ordered by the Board. :er
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8.2 Allocated crop water may be transferred to another qualified landowner upon the application and signature of both the transferring landowner and the owner to whom the water is transferred. The application must be made at the Gravelly Ford Water District. Payment shall remain the responsibility of the transferring landowner. The water transfer shall be subject to 1) the provisions of the original application and 2) the ability of the District to deliver the water.

Landowners with one or more parcels of land within the District may make one application covering all lands in accordance with the requirements of Rule 5 of these Rules. Consolidation of Accounts is not permitted unless it falls under Rule 8.2 of these Rules and Regulations.

WASTE OF WATER

9.1 Water users wasting water--either willfully, carelessly, on account of defective or inadequate ditches or structures, or because of inadequate land preparation--may be refused further service unless such conditions are remedied immediately upon notice given by the ditchtender or authorized agents of the District. Waste of water or pollution of other improper use of water will be reported to the appropriate authorities.

RULE 10

IRRIGATION OF EXCESSIVELY
HIGH GROUND

10.1 The District shall not be required to raise water to an excessive height in canals or ditches or other structures to provide service to lands or ditches of excessive elevation. Excessive elevation exists in those circumstances in which a particular diversion would jeopardize District delivery systems and/or interfere with any water user's service above or below such a diversion.

RULE 11

PUMPING RULES

11.1 All water users pumping water from canals, streams or other structures shall be governed in all respects by the rules and regulations applicable to users of gravity service.

11.2 The District will not be held responsible for any debris which may accumulate in stream flow which may tend to decrease the full operative capacity or pumps or pipelines.

RULE 12

OBSTRUCTIONS OF CANALS, USE OF CANALS AND
RIGHTS OF WAY AND TAMPERING WITH AND
DAMAGE TO DISTRICT FACILITIES

12.1 No fences shall be built, trees planted, or structures placed on any right of way or other property of the District without the prior written permission of the District.

12.2 Trash, rubbish, debris, fences and crops, including vines and trees, shall be deemed to be an obstruction and, upon notification from the District, the water user shall immediately remove said obstruction. If the obstruction is not removed within a reasonable time, the District will remove the obstruction and bill the water user for any costs incurred by the District.

12.3 Soil or other debris which is deposited or placed upon or into the District's canals or other facilities by a user because of seepage through or breakage of a canal or ditch bank or wall, by irrigation water, overflow, tail water, return water, or other flow under the control of the user, shall be deemed to be an unlawful obstruction to the flow of said canal or other facility. Upon notification by the District, the user shall immediately remove said soil or other obstruction and take the necessary steps to insure that a similar occurrence does not take place.

If, after 10 days notification, the user does not comply, the District may, at its option, take whatever steps it deems necessary to remedy the obstruction and bill the user for any costs incurred by the District. The District may also seek any other remedy available including a criminal charge and penalties.

12.4 Any water user or his or her authorized agent or employee who may use of the right of way or other property of the District for movement of machinery, whether authorized or not, shall be responsible to the District for any damage to District property.

12.5 Any person entering upon the property of the District does so at his or her own risk and any person using any canal right of way for any purpose assumes all risk of doing so and accepts responsibility for any damage to District property resulting therefrom, and for any damage to private property caused by such damage to District property.

12.6 Under no circumstance shall any water user modify a District structure or meter box. If such modifications are made, the District may remove the installation and bill the user for any cost incurred.

12.7 Use of any and all canals and structures belonging to the District is under the exclusive jurisdiction of the District and any person who travels any operating road or in any manner molests or tampers with any of the facilities is subject to prosecution.

12.8 Any damage to canal or drain banks by any one using farming equipment or other vehicles shall be the responsibility of the person making such use of the property. In the case of an employee or other agent of a water user, the water user shall also be responsible. If it becomes necessary for the District to repair any such damage, the offending person, or in appropriate circumstances the water user, must pay the cost of such repairs.

RULE 13

TAMPERING WITH WATER CONTROLS

13.1 No person who is not an employee or authorized agent of the District shall change, alter, or disturb any valve, gate, weir boards, pump or other device used by the District to control the flow of water. Violation of this Rule is a crime punishable by fine or imprisonment in jail or both.

13.2 Section 592 of the California Penal Code provides as follows:

Every person who shall, without authority of the owner or managing agent, and with the intent to defraud, take water from any canal, ditch, flume or reservoir used for the purpose of holding or conveying water for manufacturing, agriculture, mining, irrigating, or generation of power, or domestic use, or who shall without likely authority, raise, lower or otherwise disturb any gate or other apparatus thereof, used for the control or measurement of water, or who shall empty or place, or cause to be emptied or placed, into any such canal, ditch, flume or reservoir, any rubbish, filth, or obstruction to the free flow of water, is guilty of a misdemeanor.

RULE 14

ENCROACHMENTS ON DISTRICT RIGHTS OF WAY AND OTHER PROPERTY

14.1 A permit is required before any drains, trees, crossings, fences, structures, access, use or other encroachments will be permitted to be used or installed upon District rights of way. Applications for encroachment must be made at the District office.

14.2 All encroachments must be approved by the Board and if any construction of works is required, said construction will be done according to the specifications of the District at the sole expense of the applicant. Any works so constructed will be maintained at by the applicant. The District reserves the right to supervise the construction of any works and to require a maintenance level satisfactory to the District.

14.3 If a permit is granted, the applicant shall personally sign an agreement with the District indemnifying the District for and saving the District harmless from and any and all liability of any kind for injuries to persons or damages to property caused by or resulting in any manner from the applicant's exercise of rights and privileges given in the encroachment permit. Irrespective of the execution of any such agreement, however, the applicant by making application for an encroachment permit and use of any permit granted by the District agrees to such terms.

14.4 The Board, in granting the issuance of an encroachment permit, may require that the applicant obtain personal injury and property damage insurance, a bond or other surety [hereafter termed "insurance"] of a form and in an amount satisfactory to the Board and naming the District and the individual officers and Board members as additional named insureds. The Board may require the filing of a certificate prior to the issuance of any permit or as a condition of its continued use. The District reserves the right to require insurance coverage as a condition of continued use of a permit previously issued without any showing of change of circumstances or other cause for doing so.

14.5 All encroachment permits are subject to the conditions and specifications contained on such permit and to such additional conditions as may be imposed by the Board from time to time by lawful resolution, upon notice to water users and permit holders.

14.6 Issuance of an encroachment permit in no way grants a permanent or vested right, and if the District determines at a future date that any works constructed or other use pursuant to any permit interferes with operations of the District, any works so constructed shall be removed and the right of way or other property shall be restored to its condition immediately prior to such construction. The cost of any such restoration shall be at the sole expense of the permit holder.

14.7 By granting an encroachment permit, the District does in no way surrender or subordinate its control or supervision over the encroachment structure or use or the rights of way involved.

RULE 15

LIABILITY FOR DAMAGES

15.1 The District will not be liable for any damage caused by the negligence or carelessness of its agents or employees in the delivery of water, or for failure to maintain any ditch for which it is wholly or in part responsible, or for damage caused by the District's facilities, rights of way or equipment.

15.2 A shortage of water may occur from time to time in the quantity of water available to the District, either from the United States or from the District's other sources. In no event shall any liability accrue against the District, or any of its offices, agents or employees for any damage arising directly or indirectly from or because of miscalculations in estimating needs, deficiency of water supply, failure to deliver water, drought or other causes.

15.3 Any claim for damages resulting from the District's acts or omissions of its employees requires that a verified claim giving full particulars--the date, the nature of the occurrence, the area, crop and extent of any damage, among other things--be filed by the party claiming injury or damage within 100 days of the occurrence at the offices of the District or to its legal counsel. All requirements which are set forth in Title 1, Division 3.6, Part 3 of the California Government Code must be followed by the party claiming injury or damage. No suit may be brought against the District unless a claim is presented which complies with the requirements of the Government Code. The District encourages filing of claims by the party claiming injury at the earliest possible date so that the extent of damage can be determined.

15.4 The District reserves the right to stop the flow of any stream, channel, pipeline or ditch at any time the Board or its authorized agents may determine such action to be necessary.

15.5 The District will not be liable for any damages to third persons caused by the use of its facilities, equipment, rights of way or property by persons other than District employees.

RULE 16

PENALTY FOR NONCOMPLIANCE

16.1 Refusal to comply with requirements violation of any provision of these Rules and Regulations may be sufficient cause for termination of District provided services until full compliance is made.

RULE 18

18.2 Prior notice of Rule changes will not be given except in the case of changes in the conditions of existing encroachment permits, in which case five (5) days notice will ordinarily be given to the permit holder, unless the Board determines notice cannot reasonably be given or an emergency situation exists, in which event notice may be dispensed with. In such cases, the permit holder may be heard on such changes at the next regular meeting of the Board.

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JAMES KEATING

GEORGE ANDREW

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ATTACHMENT

D

Gravelly Ford Water

1836 West Fifth Street
Madera, CA 93637

Invoice

DATE	INVOICE #
8/10/2008	2389

User

Owner

Meter reading	Total ac. ft.	Rate per acre foot	Amount
7/1/08 - 8/1/08 Turnout #22 Starting meter reading: 710.236 Ending meter reading: 747.342 Irrigation water	37.11	35.00	1,298.85
Turnout #4 South Line Starting meter reading: 825.337 Ending meter reading: 843.302 Irrigation water	17.97	35.00	628.95
Total			\$1,927.80

Please make checks payable to Gravelly Ford Water District and mail to 1836 West 5th St.,

ATTACHMENT

E

Water Shortage Allocation Policy

The District's water supply is a Class 2 supply which is only available in above average water supply years. Accordingly, all growers have wells to provide for their water demands during periods when District supplies are not available.

When there is insufficient District water available, the District imposes a rotation system for delivery to assure that all growers have an opportunity to receive District water.

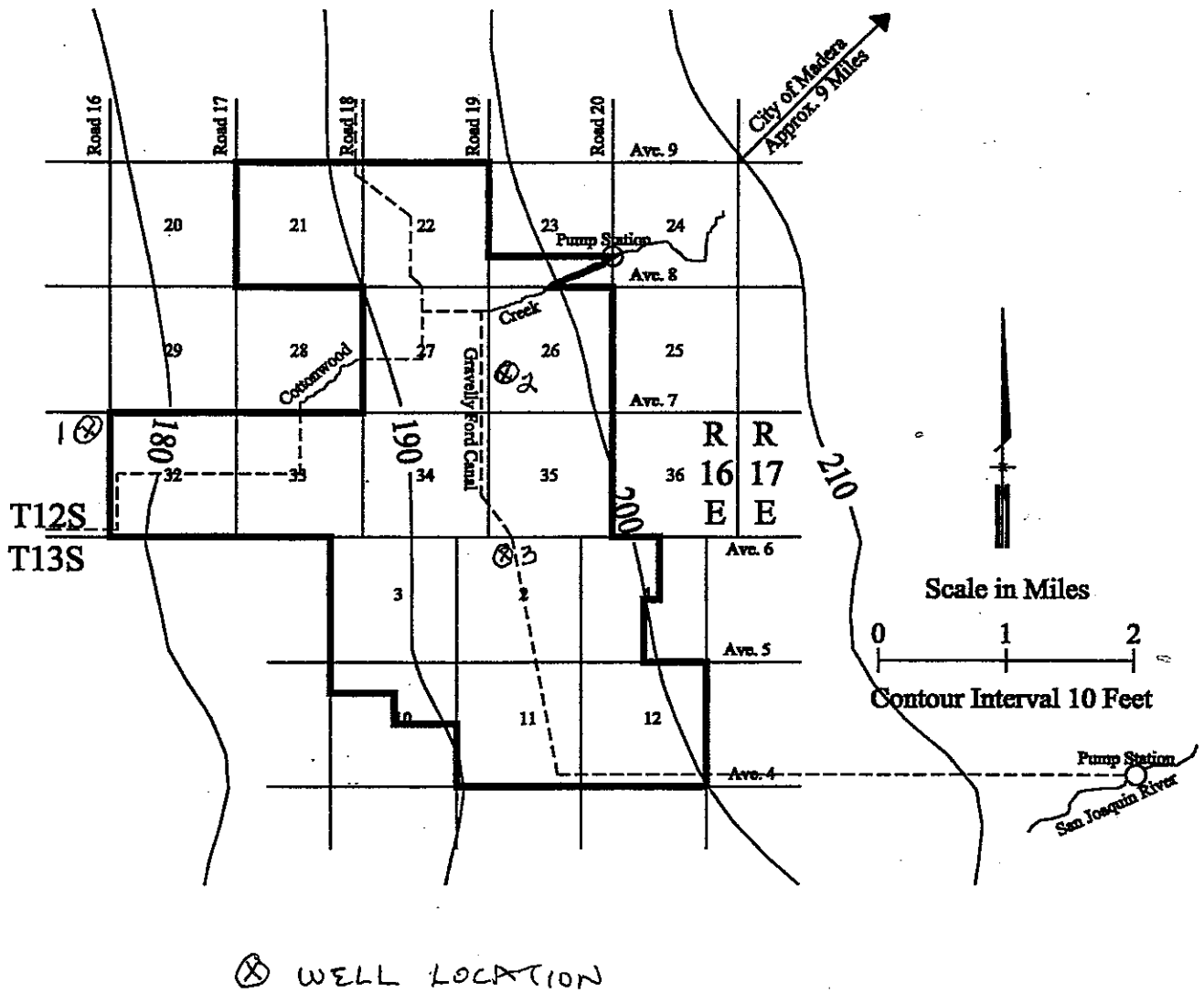
When there is no water in the District's canals, growers are allowed to pump in at one location and pull out at another turnout if this can be accomplished. There is no charge to growers to utilize the system during hardship conditions.

Refer to Attachment C, Rules & Regulations Page 2, Rules 4.2, 4.5 and Page 4 Rules 6.10 and 6.11.

ATTACHMENT

F

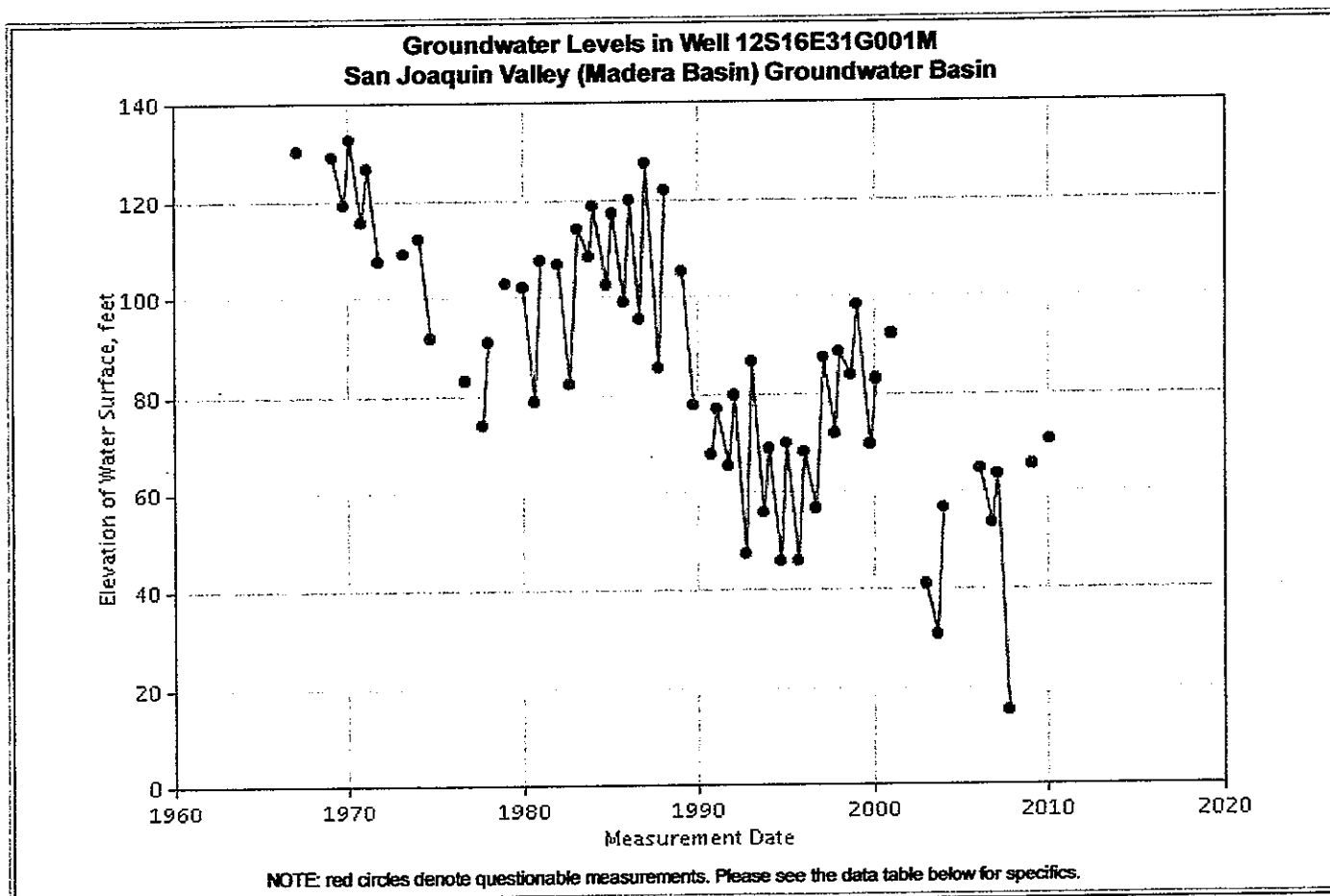
Figure 1
Ground Surface Elevation



①

Groundwater Level Data for Well 12S16E31G001M

Your selection returned a total of 75 records. Wells in the Department of Water Resources monitoring network are identified by a State Well Number, which is based on the Public Land Grid System. The table headings and records contain several codes and abbreviations. Press the **New Search** or **Nearby Search** buttons or at the bottom of the page to begin a new data retrieval. Data for this well can also be downloaded in MS Excel or text delimited format.

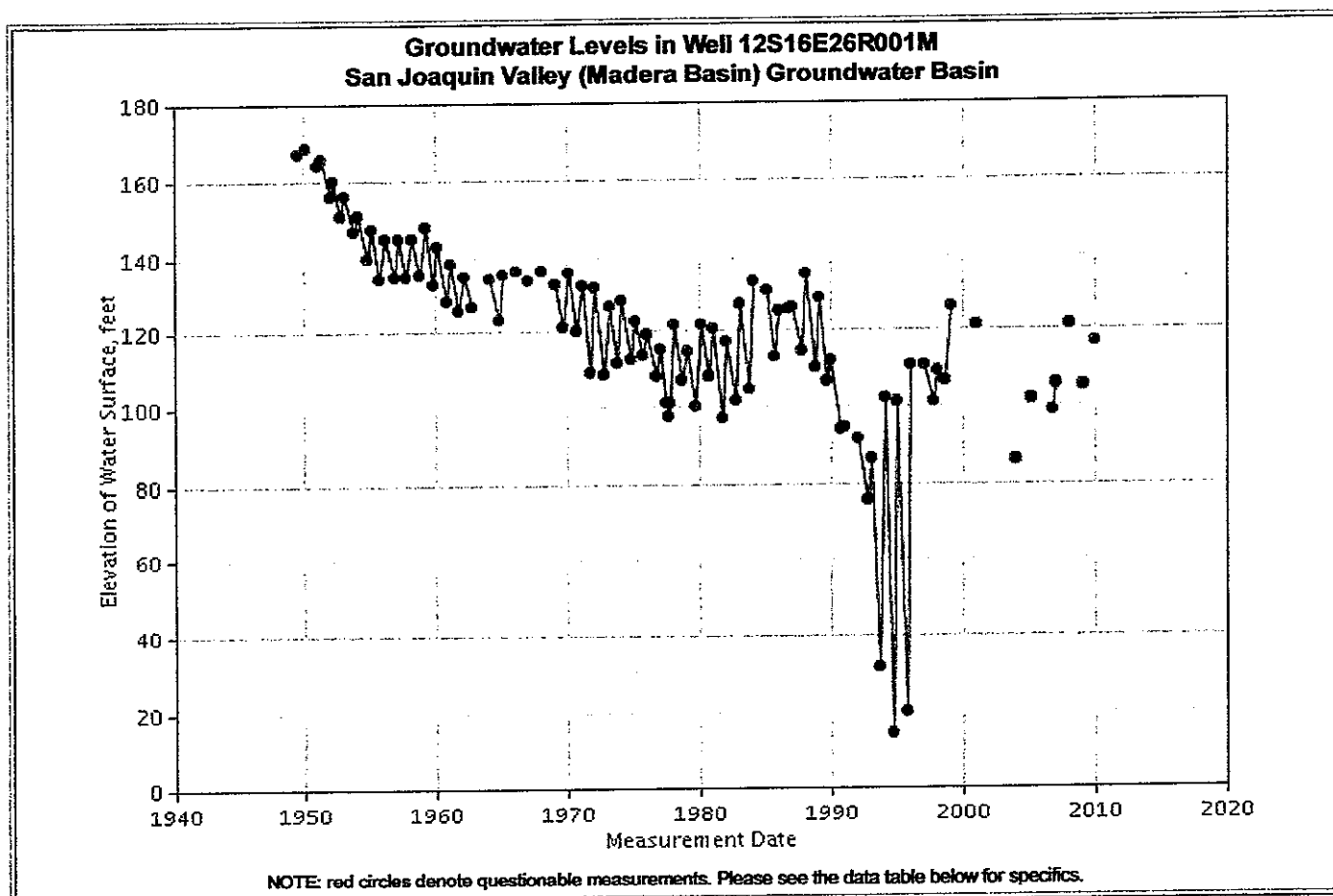


Groundwater Level Readings

Meas. Date	R.P. Elev.	G.S. Elev.	RPWS	WSE	GSWS	QM Code	NM Code	Agency	Comment
02-08-1967	178.5	177.5	48.0	130.5	47.0			5001	
02-08-1968	178.5	177.5					1	5001	
02-11-1969	178.5	177.5	49.4	129.1	48.4			5001	
10-02-1969	178.5	177.5	59.0	119.5	58.0			5001	
02-04-1970	178.5	177.5	45.6	132.9	44.6			5001	
10-01-1970	178.5	177.5	62.8	115.7	61.8			5001	
02-09-1971	178.5	177.5	51.8	126.7	50.8			5001	
10-15-1971	178.5	177.5	70.7	107.8	69.7			5001	
02-10-1972	178.5	177.5					1	5001	
10-04-1972	178.5	177.5					1	5001	
02-26-1973	178.5	177.5	69.2	109.3	68.2			5001	
02-07-1974	178.5	177.5	66.0	112.5	65.0			5001	
10-08-1974	178.5	177.5	86.5	92.0	85.5			5001	

Groundwater Level Data for Well 12S16E26R001M

Your selection returned a total of 111 records. Wells in the Department of Water Resources monitoring network are identified by a State Well Number, which is based on the Public Land Grid System. The table headings and records contain several codes and abbreviations. Press the **New Search** or **Nearby Search** buttons or at the bottom of the page to begin a new data retrieval. Data for this well can also be downloaded in [MS Excel](#) or [text delimited format](#).



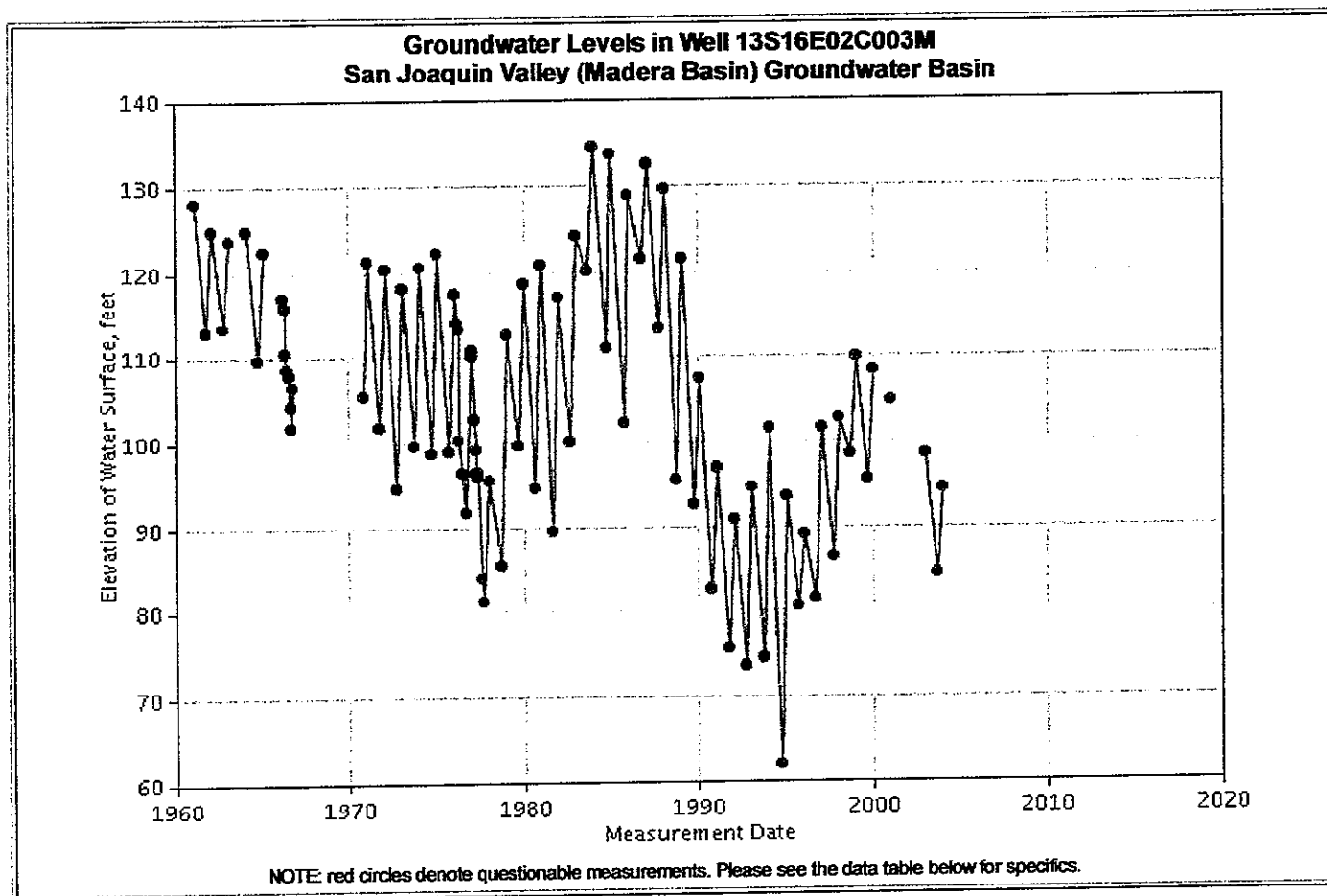
Groundwater Level Readings

Meas. Date	R.P. Elev.	G.S. Elev.	RPWS	WSE	GSWS	QM Code	NM Code	Agency	Comment
07-18-1949	201.6	201.6	34.6	167.0	34.6			5001	
01-10-1950	201.6	201.6	33.1	168.5	33.1			5001	
12-12-1950	201.6	201.6	37.4	164.2	37.4			5001	
03-19-1951	201.6	201.6	35.9	165.7	35.9			5001	
12-08-1951	201.6	201.6	45.7	155.9	45.7			5001	
03-10-1952	201.6	201.6	41.7	159.9	41.7			5001	
10-13-1952	201.6	201.6	50.5	151.1	50.5			5001	
01-14-1953	201.6	201.6	45.8	155.8	45.8			5001	
09-25-1953	201.6	201.6	54.8	146.8	54.8			5001	
01-19-1954	201.6	201.6	50.5	151.1	50.5			5001	
10-01-1954	201.6	201.6	61.7	139.9	61.7			5001	
01-26-1955	201.6	201.6	54.1	147.5	54.1			5001	
09-28-1955	201.6	201.6	67.2	134.4	67.2			5001	

3

Groundwater Level Data for Well 13S16E02C003M

Your selection returned a total of **100** records. Wells in the Department of Water Resources monitoring network are identified by a State Well Number, which is based on the Public Land Grid System. The table headings and records contain several codes and abbreviations. Press the **New Search** or **Nearby Search** buttons or at the bottom of the page to begin a new data retrieval. Data for this well can also be downloaded in MS Excel or text delimited format.



Groundwater Level Readings

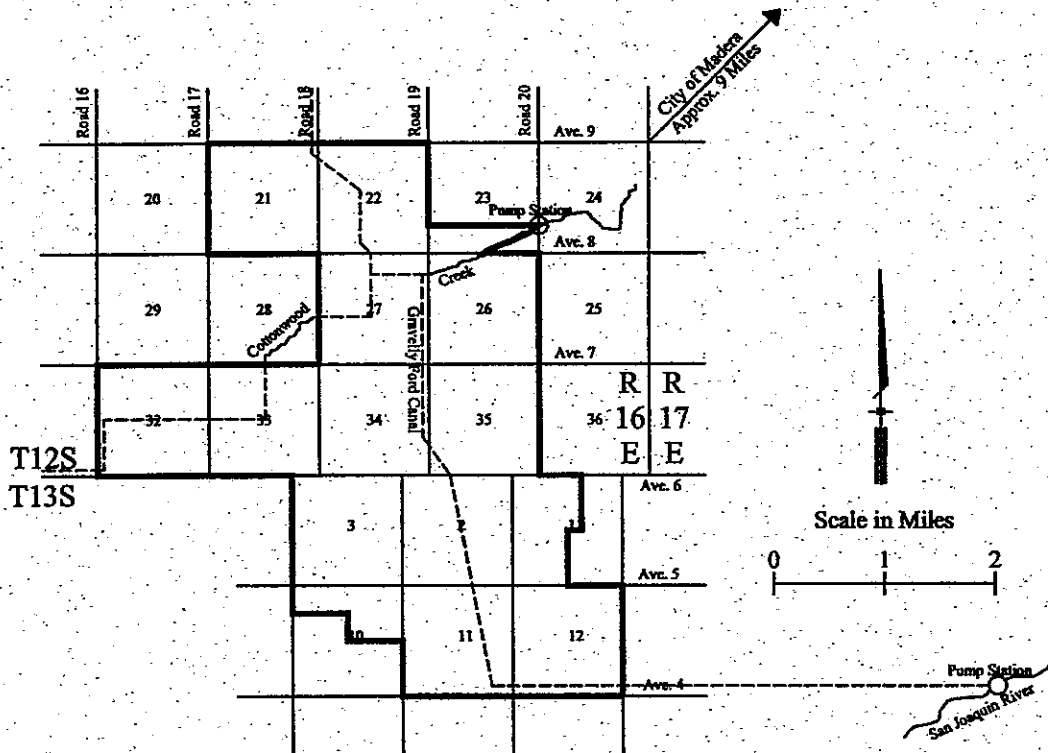
Meas. Date	R.P. Elev.	G.S. Elev.	RPWS	WSE	GSWS	QM Code	NM Code	Agency	Comment
02-21-1961	194.6	194.0	66.5	128.1	65.9			5050	
10-24-1961	194.6	194.0	81.5	113.1	80.9			5001	
02-26-1962	194.6	194.0	69.8	124.8	69.2			5001	
10-17-1962	194.6	194.0	81.1	113.5	80.5			5001	
02-12-1963	194.6	194.0	70.8	123.8	70.2			5001	
02-11-1964	194.6	194.0	69.7	124.9	69.1			5001	
10-06-1964	194.6	194.0	84.9	109.7	84.3			5001	
02-08-1965	194.6	194.0	72.1	122.5	71.5			5001	
03-25-1966	194.6	194.0	77.5	117.1	76.9			5530	
04-25-1966	194.6	194.0	78.8	115.8	78.2			5530	
05-23-1966	194.6	194.0	84.0	110.6	83.4			5530	
06-27-1966	194.6	194.0	86.1	108.5	85.5			5530	
07-25-1966	194.6	194.0	86.7	107.9	86.1			5530	

ATTACHMENT

G

Daw's Copy

Gravelly Ford Water District Groundwater Management Plan



by

Lewis E. Bair

Jacob J. Westra

Adopted 4/13/98 Amended 10/03/00

BEFORE THE BOARD OF DIRECTORS OF THE GRAVELY FORD WATER
DISTRICT, MADERA COUNTY, CALIFORNIA

RESOLUTION OF THE GRAVELY FORD WATER DISTRICT AMENDING
CURRENT GROUNDWATER MANAGEMENT PLAN

WHEREAS, the California State Legislature has authorized the District, and other local public entities, to develop, adopt and implement groundwater management plans pursuant to Water Code Sections 10750 et seq.; and

WHEREAS, regarding all the lands which are contained within the boundaries of the legal description of the Gravelly Ford Water District as of October 3, 2000, including Sections 21, 22, 26, 27, 32, 33, 34, 35 and a portion of Section 23 in Township 12 S, Range 16 E, MDB&M, and Sections 2, 3, 11, 12, and portions of Sections 1 and 10 in Township 13 S, Range 16 E, MDB&M; and

WHEREAS, the Gravelly Ford Water District adopted its AB 3030 Groundwater Management Plan on April 13, 1998; and

WHEREAS, on July 11, 2000 the Madera County Board of Supervisors enacted Ordinance 573A entitled "Rules and Regulations Pertaining to Groundwater Banking; Importation of Foreign Water, for the Purpose of Groundwater Banking to Areas of Madera County Which Are Outside of Local Water Agencies That Deliver Water to Lands Within Their Boundaries; and Exportation of Groundwater Outside the County"; and

WHEREAS, on October 3, 2000, the Gravelly Ford Water District adopted Ordinance 2-2000 entitled "Rules And Regulations Pertaining To Groundwater Banking; Importation Of Foreign Water For The Purpose Of Groundwater Banking; Exportation Of Groundwater Outside The District; And Use Of District Facilities For Such Purposes"; and

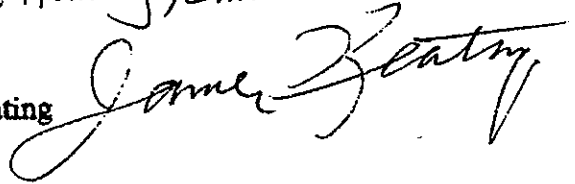
WHEREAS, it is in the best interest of the District and the landowners within the District to have the District's Groundwater Management Plan to be in conformity with the Madera County Ordinance and Gravelly Ford Water District Ordinance 2-2000 for the coordination of long-term management of the groundwater resources and to protect the availability of groundwater for continued use in future years; and

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors amends the Gravelly Ford Water District Groundwater Management Plan adopted April 13, 1998 by deleting the current Section 6 (Regulations Pertaining to Exportation of Groundwater) of Part IV (Plan Items) and replacing it with the District "Groundwater Exportation, Groundwater Banking, Importation of Foreign Water, and Use of District Facilities for Such Purposes" Ordinance as the new Section 6.

THE ABOVE RESOLUTION was passed and adopted by the following vote of the Board of Directors of the Gravelly Ford Water District this October 3, 2000.

AYES: Basila, DaSilva, Andrews, Keating, Emmert
NOES:
ABSENT:

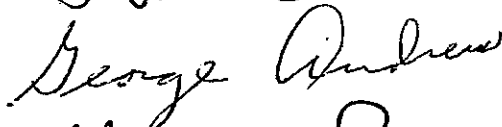
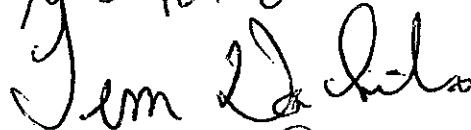
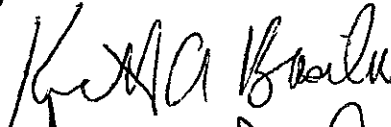
/s/ James Keating
President



ATTEST:

KENNETH A. BASILA

/s/ ~~Timothy DaSilva~~;
Secretary



BEFORE THE BOARD OF DIRECTORS OF
THE GRAVELLY FORD WATER DISTRICT
MADERA, CALIFORNIA

ORDINANCE NO. 98-1

ORDINANCE ADOPTING GROUNDWATER MANAGEMENT PLAN
FOR THE GRAVELLY FORD WATER DISTRICT

WHEREAS, Part 2.75 (commencing with Section 10750) of Division 6 of the California Water Code authorizes local agencies such as the Gravelly Ford Water District to adopt and implement groundwater management plans within all or a portion of their service areas; and

WHEREAS, this District has prepared, in accordance with the procedures prescribed by law, a groundwater management plan for the Gravelly Ford Water District; and

WHEREAS, this Board has given notice and held a public hearing to determine whether to adopt such a plan, all in accordance with the provisions of law;

BE IT ORDAINED BY THE BOARD OF DIRECTORS OF THE GRAVELLY FORD WATER DISTRICT AS FOLLOWS:

Section 1. The groundwater management plan prepared for Gravelly Ford Water District described in Section 2 hereof which is set forth in the document entitled Gravelly Ford Water District Groundwater Management Plan dated January 1998, on file with the Secretary of this District is hereby adopted, and the District is hereby ordered to implement such a plan in accordance with the provisions thereof.

Section 2. Gravelly Ford Water District includes all of the lands which are contained within the boundaries of the legal description of the Gravelly Ford Water District as of August 11th, 1997, including Sections 21, 22, 26, 27, 32, 33, 34, 35 and a portion of Section 23 in Township 12 S, Range 16 E, MDB&M, and Sections 2, 3, 11, 12, and portions of Sections 1 and 10 in Township 13 S, Range 16 E, MDB&M.


THE FOREGOING ORDINANCE was passed and adopted by the following vote of the Board of Directors of the Gravelly Ford Water District this 13th day of April, 1998.

AYES: Directors Keating, Andrew, DaSilva,

NOES: None

ABSENT: Schafer, Basila

ATTEST:


Timothy DaSilva


President

GROUNDWATER MANAGEMENT PLAN

for

GRAVELLY FORD WATER DISTRICT

Prepared by

Lewis E. Bair

&

Jacob J. Westra

January 1998

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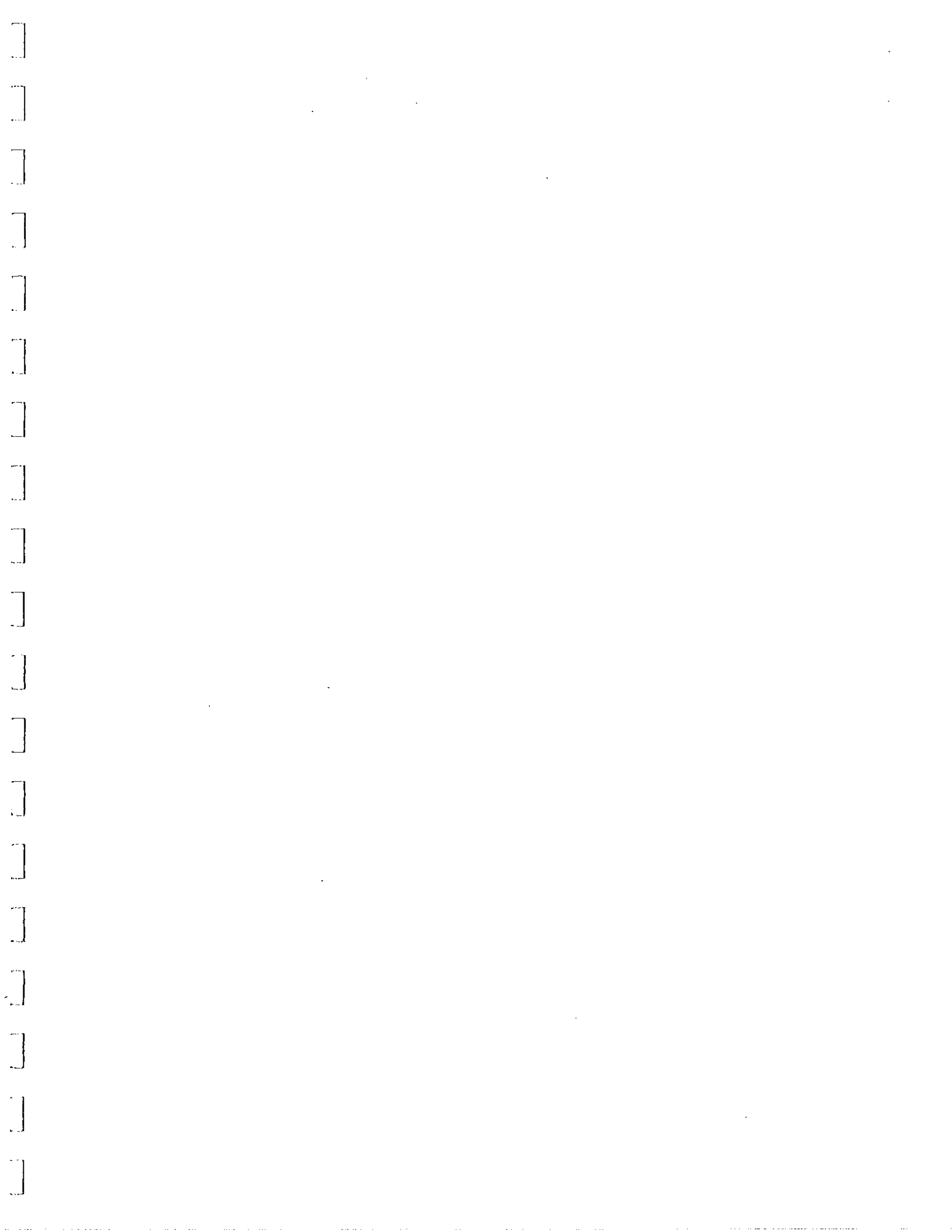
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LIST OF ACRONYMS

AB 3030	California Assembly Bill 3030
AF	Acre-Feet
CEQA	California Environmental Quality Act
CVP	United States Bureau of Reclamation, Central Valley Project
DWR	California Department of Water Resources
ET	Evapotranspiration
GFWD	Gravelly Ford Water District
MID	Madera Irrigation District
MSL	Mean Sea Level
PG&E	Pacific Gas and Electric Company
ppm	Parts Per Million
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
USBR	United States Bureau of Reclamation



I. INTRODUCTION

1. General

The Gravelly Ford Water District (GFWD) is a public water district covering an area of approximately 8,300 acres in Madera County. In 1942 a group of farmers formed the Gravelly Ford Water Users Association with the intention of obtaining a permanent surface water supply. They were denied, and told that only water districts formed under California Law would be eligible for federal water contracts. This eventually led to the formation of GFWD in 1962. In 1981 the district signed its first permanent water contract with the United States Bureau of Reclamation (USBR) for 14,000 acre-feet (AF) of Class II water. That same year the district floated a bond to pay for upgrades to GFWD's distribution system. Since this time GFWD has actively pursued additional surface water supplies. They currently have a contract with Madera Irrigation District (MID) for spill water in Cottonwood Creek and have submitted an application to appropriate 5,000 AF of water from Cottonwood Creek.

Subsequent to the implementation of California Assembly Bill No. 3030 (AB 3030) on January 1, 1993, GFWD's board of directors adopted a resolution of intention on August 11, 1997 to draft a groundwater management plan. The resolution is attached in Appendix A.

A. Purpose

The purpose of this groundwater management plan is to develop an organized approach to the evaluation and management of groundwater in GFWD. Effective groundwater management is vital to GFWD due to their heavy reliance on a conjunctive use system. With the use of groundwater as a supplemental resource, and the difficulty in obtaining new surface

water supplies, it is important for GFWD to manage this resource effectively.

B. Goals

The goals of this groundwater management plan are to actively manage the groundwater within GFWD in order to mitigate conditions of overdraft and to maintain high-quality, contaminant free groundwater. It is desirable to formulate and implement the plan at the local level rather than having management imposed by the state or federal government.

Upon its adoption, the goals of this plan will be carried out through the implementation of specific programs listed within the plan. The initial program will consist of monitoring groundwater elevations and quality. If evaluation of data collected indicates a need, implementation of additional programs will be considered. If the long term trend in groundwater overdraft continues, it may be necessary to implement more rigorous programs.

C. Authority

AB 3030, which became a law on January 1, 1993 (California Water Code, Sections 10750 et seq.), authorized local agencies that are within groundwater basins, as defined in California Department of Water Resources (DWR) Bulletin 118-80 (Appendix B), and that meet certain other criteria, to prepare and adopt groundwater management plans. GFWD qualifies under the law.

II. EXISTING CONDITIONS

1. Description of Study Area

A. Location

GFWD is located southwest of the City of Madera and encompasses a land area of approximately 8,300 acres. It is adjacent to Cottonwood Creek and extends south towards the San Joaquin River. The district is contained in the southeastern portion of Township 12 South, Range 16 East, and in the northeastern portion of Township 13 South, Range 16 East, Mount Diablo Base & Meridian.

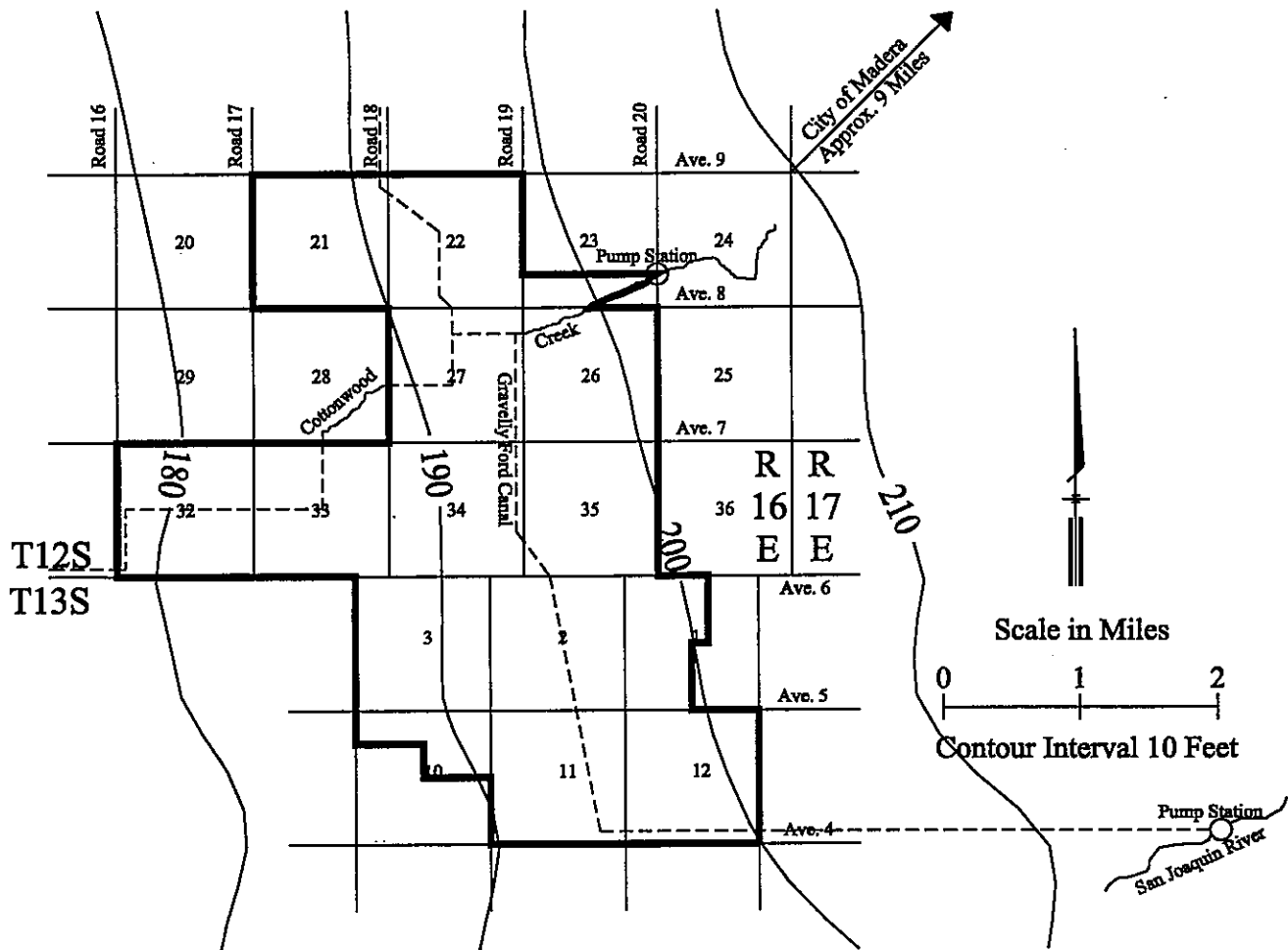
B. Topography

The surface topography is relatively flat with a slight gradient downward from east to west, Figure 1. Ground surface elevations range from 180 to 200 feet above mean sea level (MSL).

C. Climate

The climate in this area is seasonal with fairly mild winters and long, hot summers. Summer has a daily maximum temperature in the upper 90's to low 100's with extremes around 110°F (SCS 1951). January minimum temperatures have been a couple of degrees above freezing. The skies are clear 95 percent of the time in the summer and 50 percent of the time during the winter months. These temperatures and long sunny days allow for a growing season of approximately 265 days. These are average numbers reflecting the trend in the San Joaquin Valley. Historical annual

Figure 1
Ground Surface Elevation



rainfall for this area has averaged only 8.5 inches for the time period from 1957 through 1996, with a low of 4.6 inches in 1989 to a high of 16.4 inches in 1978.

2. Water Supply

A. Historical and Projected Water Supply

Until the construction of the water delivery system in 1984, water demand in GFWD was met through groundwater pumping and Cottonwood Creek surface waters. In 1981 GFWD obtained a Class II water contract of 14,000 AF from the San Joaquin River. These Class II waters are only available in plentiful water years. GFWD also has a contract with MID to purchase all spill waters in Cottonwood Creek. Rainfall in GFWD amounts to approximately 22 percent of the annual water demand from 1971 to 1996.

GFWD has applied to appropriate 5,000 AF of water from Cottonwood Creek, and is currently waiting for approval. The district continually pursues all available surface waters.

B. Additional Water Supplies

During heavy rain flood waters are released into the San Joaquin River. GFWD already diverts these waters for recharge in the Gravelly Ford Canal. If GFWD's recharge facilities were expanded more of these waters could be diverted to supplement the existing conjunctive use system. It is not anticipated that other significant sources of surface water will be available without increased storage facilities on the San Joaquin River.

3. Water Demand

A. Land Use and History

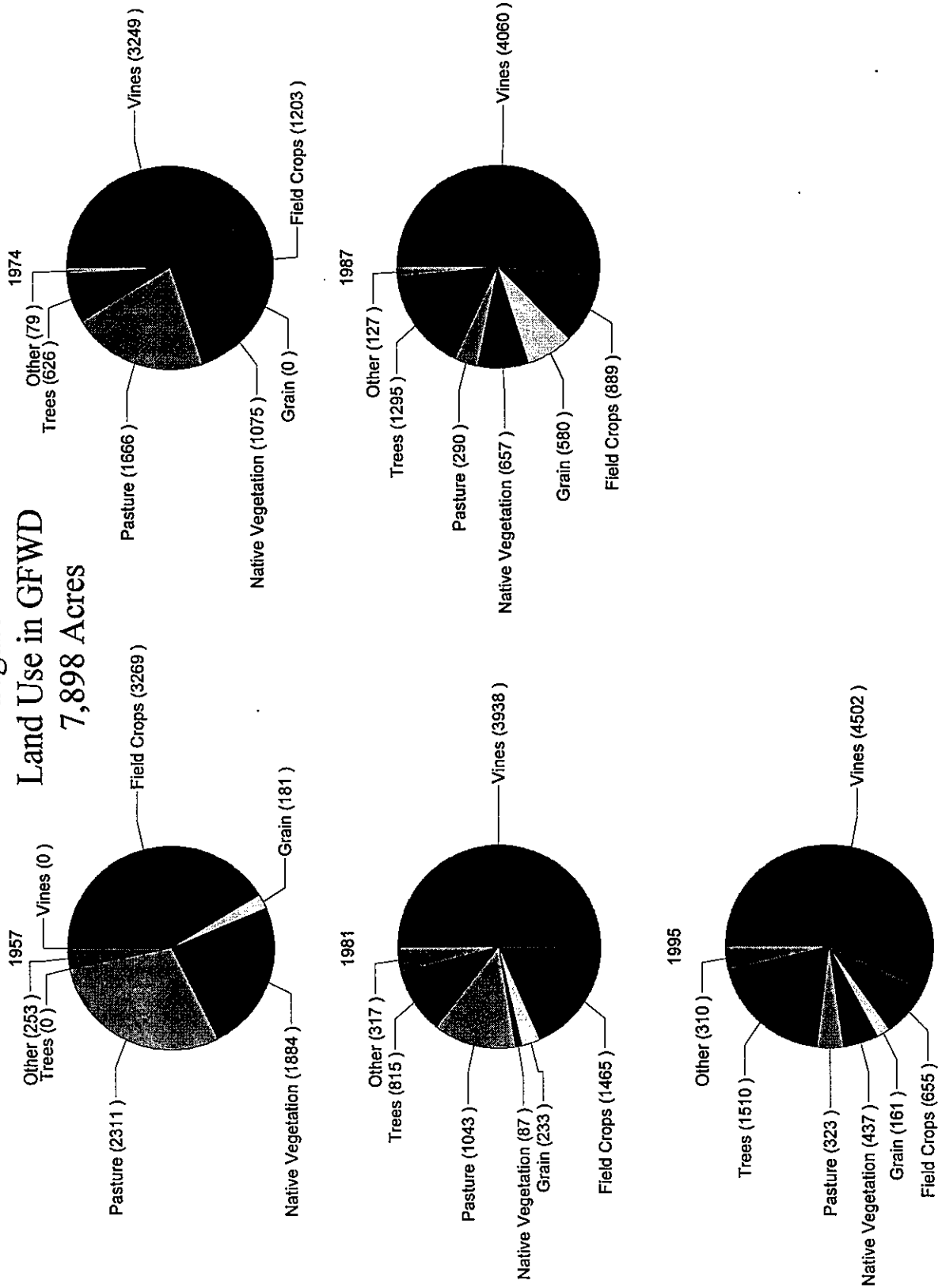
Land use surveys conducted by DWR (1957, 1974, 1981, 1987, 1995) indicate that in 1957, the lands within GFWD were dominated by field crops (3,269 acres), pasture (2,311 acres), and native vegetation (1,884 acres) as shown in Figure 2. By 1981, nearly all of the land was developed and the introduction of permanent crops was evident with fifty percent in trees and vines. By 1995 three quarters of the land was in permanent crops. This reduced field crops, pasture, and native vegetation to 19 percent of the acreage grown in 1957. Roads, head ditches, etc. account for five percent of the total acreage in GFWD. This reduces the cropped land to approximately 7,898 acres.

B. Historical Water Demand

i. Municipal, Industrial and Domestic Water Demand

The combined municipal, industrial, and domestic water requirement for GFWD has been insignificant, and has remained less than 1 percent since the 1950's. Domestic water use in GFWD consists primarily of scattered single family units using wells for potable water. There are no public water treatment facilities within GFWD.

Figure 2
Land Use in GFWD
7,898 Acres



ii. Agricultural Water Demand

As Figure 3 shows, agricultural water requirements have not increased dramatically since 1957. The development of native lands has increased the total number of acres farmed, but the total water demand has remained fairly constant. This is because the majority of the undeveloped lands along with other high water demand crops have been replaced with vines, a relatively low water demand crop. Water use in GFWD ranged from a low of 16,755 AF in 1988 to a high of 19,378 AF in 1981. These totals were calculated from DWR Land Use Surveys and evapotranspiration (ET) rates from Kings River Conservation District (1994).

iii. Other Water Demand

There is no other known water demand within GFWD.

C. Projected Water Demand

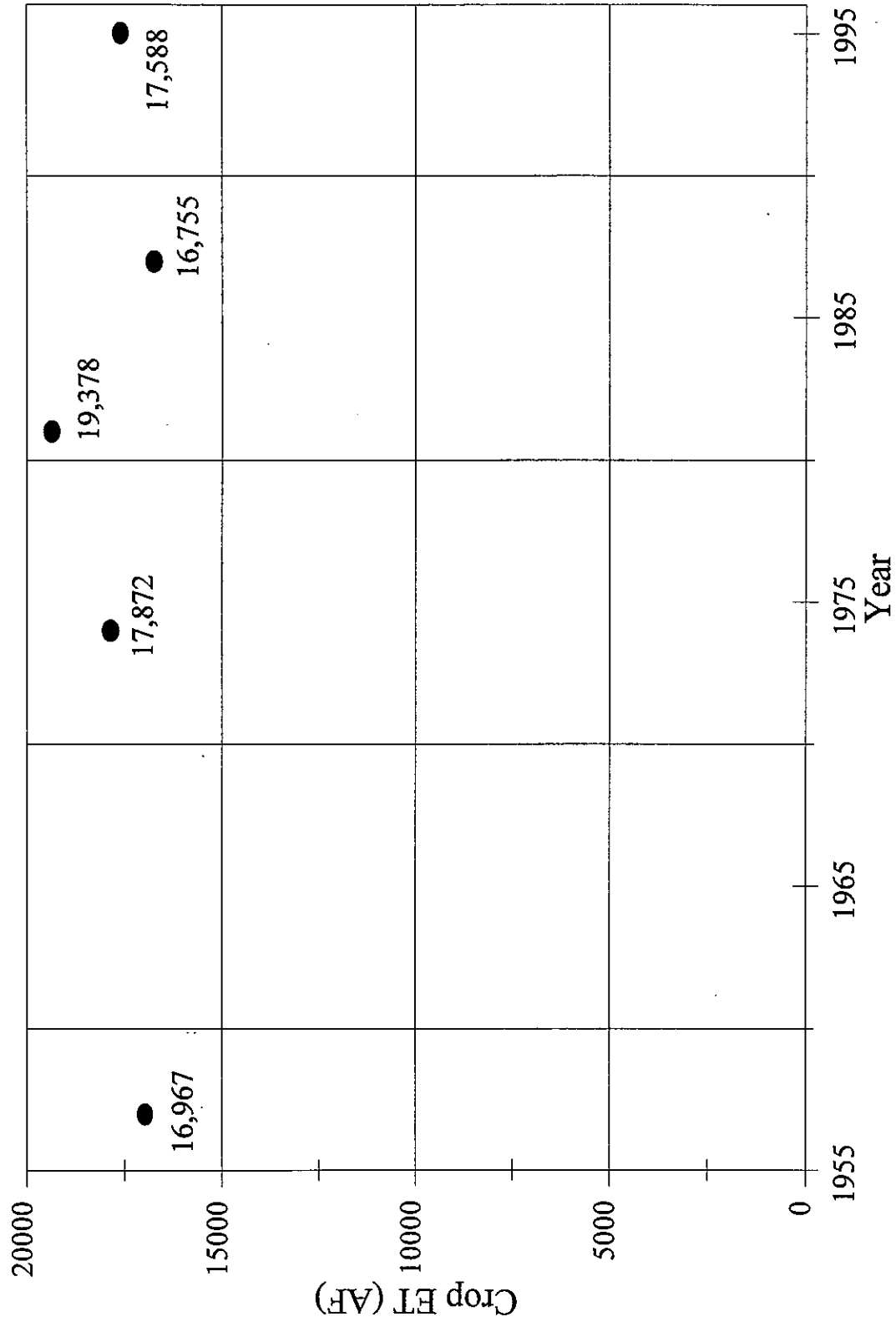
i. Municipal and Industrial Water Demand

The municipal and industrial water demand for GFWD is expected to remain less than 1 percent. If a dramatic change in municipal or industrial demand is proposed the impact on the groundwater basin should be investigated.

ii. Agricultural Water Demand

It is assumed that the agricultural water demand of GFWD will follow the stable course set since 1957. Water demand has

Figure 3
Water Demand in GFWD



averaged 17,875 AF and is expected to remain constant for the foreseeable future unless there is a major change in cropping pattern to crops of different water use.

iii. Other Water Demand

No other demand currently exists in GFWD and there is no expected change to this situation.

4. Water Quality

A. Historical Quality

Groundwater in GFWD is a high quality bicarbonate type water. Total Dissolved Solids (TDS) are well below what would be considered to be high levels. The TDS in the unconfined aquifer in 1965 ranged from approximately 300 to 400 parts per million (ppm) while the TDS in the confined aquifer ranges from 150 to 300 ppm (USGS, 1970). The base of the fresh water where the TDS measure 2,000 ppm is approximately 1,200 feet below ground surface.

B. Agricultural Water Quality Requirements

One of the issues that should be addressed in a groundwater management plan is the quality of water within the management area. A reduction in the quality of water beyond certain limits is equivalent to a loss in the useable water supply. Poor quality water can be treated but the costs are generally much higher than the cost of maintaining a high quality groundwater supply.

The salinity level in water is most often expressed by the term TDS. The presence of salts in groundwater primarily results from the chemical weathering of earth minerals from rocks and soils. The threshold values of TDS where crop yields will be reduced in GFWD are given in Table 1. To maintain optimum crop yield with the crops currently farmed in GFWD it is essential that groundwater TDS levels be maintained well below the thresholds given in Table 1.

Table 1 Salinity Thresholds for Yield Reduction	
Crop	TDS ppm
Alfalfa	1,280
Almonds	960
Beans	640
Corn	1,090
Cotton	4,930
Peaches	1,090
Vines	960

5. Water Facilities in the Study Area

A. Water Supply, Storage, Distribution and Recharge Facilities

The current surface water supply for GFWD comes from the 14,000 AF Class II water contract with the USBR, Cottonwood Creek spill water, groundwater pumping, and effective precipitation. GFWD has submitted a proposal to appropriate 5,000 AF of the waters in Cottonwood Creek. The district also diverts flood waters from the San Joaquin River when they are available.

The surface water distribution system consists primarily of the Gravelly Ford Canal. This canal stretches from the San Joaquin River to north of Cottonwood Creek. It is nearly level working much like a reservoir. The canal is unlined and built through highly permeable sandy loam soils. These properties allow the canal to operate as a recharge basin. Where needed small individual pipelines are used to deliver water to the turnouts. All turnouts in the district are metered.

B. Wastewater Treatment and Disposal/Reclamation Facilities

There are no communities within GFWD that have public wastewater treatment facilities. Residential areas and farmsteads are using septic systems.

C. Groundwater Wells

i. Municipal

No known municipal wells exist in the area. Residential areas have individual wells for domestic water use.

ii. Industrial

There is no significant industrial development in GFWD.

iii. Agricultural

Well driller's logs were obtained from DWR which show depths the wells are completed. Not all the well driller's logs are submitted to DWR. The majority of well logs in GFWD are

composite wells for agricultural water use, pumping from depths of 250 to 550 feet. In the southern tip of the district the well logs tend to be completed in the unconfined aquifer, above the E clay.

6. Groundwater Monitoring Programs

A. Groundwater Levels

The USBR and DWR both act as clearing houses to gather well level data from local agencies, private water users, etc. MID has a monitoring program that includes several wells in GFWD. Pacific Gas and Electric Company (PG&E) has historically performed pump tests in parts of GFWD but the results of these tests are confidential.

B. Water Quality

Although study specific groundwater quality has taken place in the past, no consistent groundwater quality monitoring program is in effect within GFWD.

III. EVALUATION OF GROUNDWATER CONDITIONS

1. Characteristics of the Aquifer

A. Geology of the Groundwater Basin

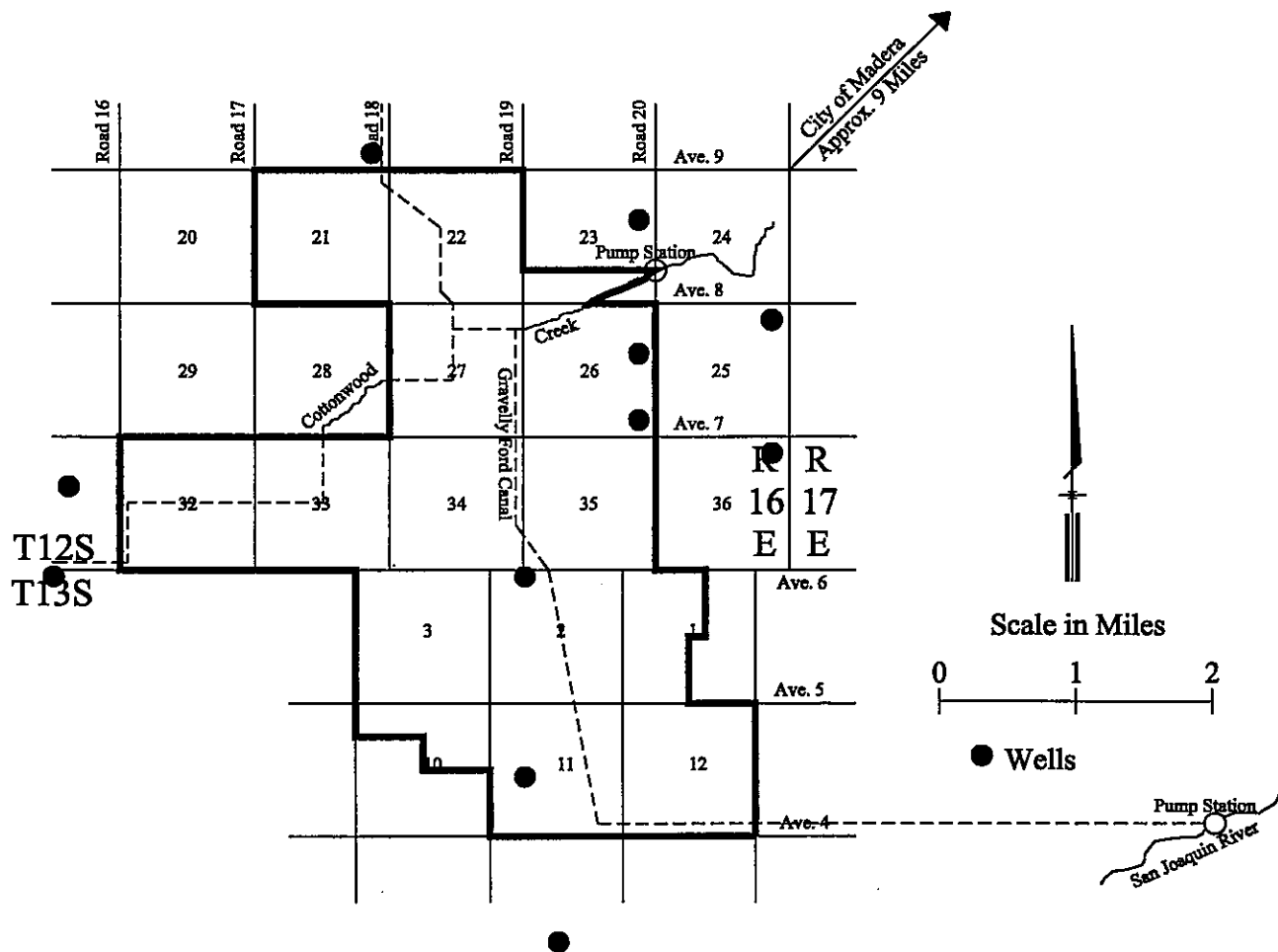
The surface soils in this area consist mainly of fine sandy loams from alluvial fans and flood plains (SCS, 1951). The subsurface soils throughout GFWD are composed of 30 to 50 percent fine and coarse sand from interwoven alluvial fans (USGS, 1970). These alluvial fans have created an effective aquifer system that has yielded large quantities of groundwater to pumping and which possesses the ability to be recharged through active and passive means.

Below the alluvial formation lies a non-permeable clay layer known as the E or Corcoran Clay. Elevation data was obtained for the E clay (USGS 1984) and then subtracted from the ground surface elevations to obtain the depth of the E clay. The bottom of the E clay ranges from 340 to 440 feet below the ground surface and is approximately 25 feet thick, Figure 4. This layer creates a confined aquifer within GFWD.

B. Capacity of the Groundwater Basin

The capacity of an unconfined aquifer is directly related to its specific yield, i.e. the higher the specific yield, the more water the aquifer holds. Specific yield is given as a ratio of the volume of water that a given aquifer will yield by gravity to the aquifer volume, usually expressed as a percent. The specific yield of an aquifer is determined by the type of material that makes up the aquifer. A gravel will have a specific yield between 15 to 25 percent while a clay will only yield 0 to 5 percent. The specific yield for GFWD is

Figure 5
Location of Monitored Wells



B. Depth to Groundwater

The average depth to groundwater in GFWD has ranged from 67 feet in 1971 to 105 feet in 1993. The average depth to groundwater is shown in Figure 6 for the time period from the spring of 1971 to the spring of 1997.

C. Groundwater Elevations

The groundwater elevations can be used to determine the direction of groundwater flow. Groundwater will flow perpendicular to the groundwater elevation contours in the direction of decreasing elevation. Figure 7 and Figure 8 show a continuing trend of groundwater flow from the east to the west. The groundwater elevations are given in feet above MSL.

D. Changes in Storage

The total change in groundwater storage for GFWD is a loss of 29,052 AF for the time period from 1971 through 1996. This amounts to a loss in storage of 1,117 AF per year. This information is calculated using a specific yield of 13 percent and a change in groundwater depth of 27 feet for the 1971 through 1996 time period. Figure 9 shows the annual change in storage from 1971 through 1996.

E. Movement of Groundwater

Groundwater flow has been from east to west since 1964 (USGS 1970) and is still the same in 1983 and 1996. These flows can be influenced on the local level depending on how much water is being extracted from the aquifer. Heavy localized pumping can cause depressions in the

Figure 6
Average Depth to Groundwater
1971 - 1997

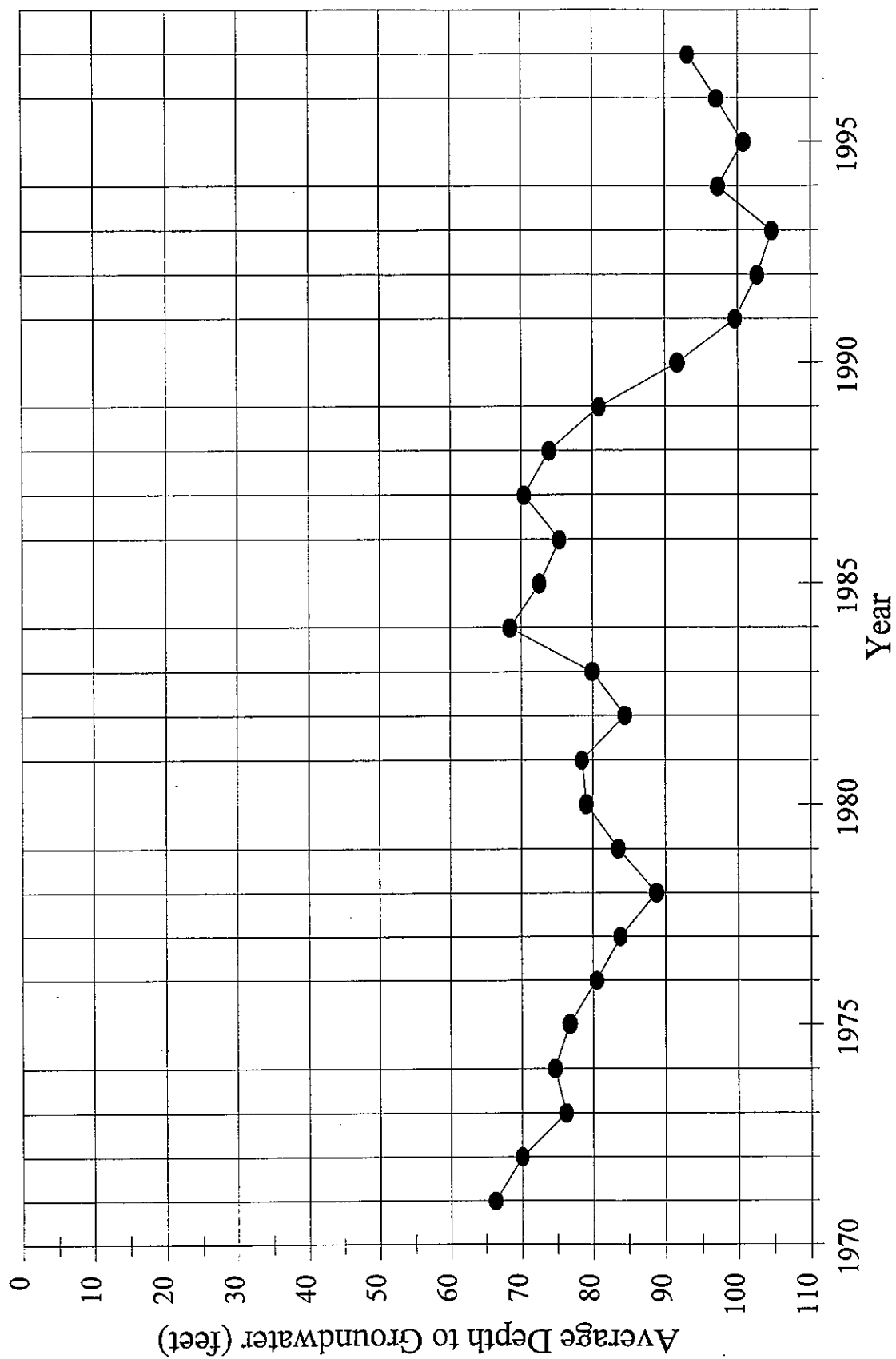


Figure 7
Groundwater Elevations in Feet Above MSL, Spring 1983

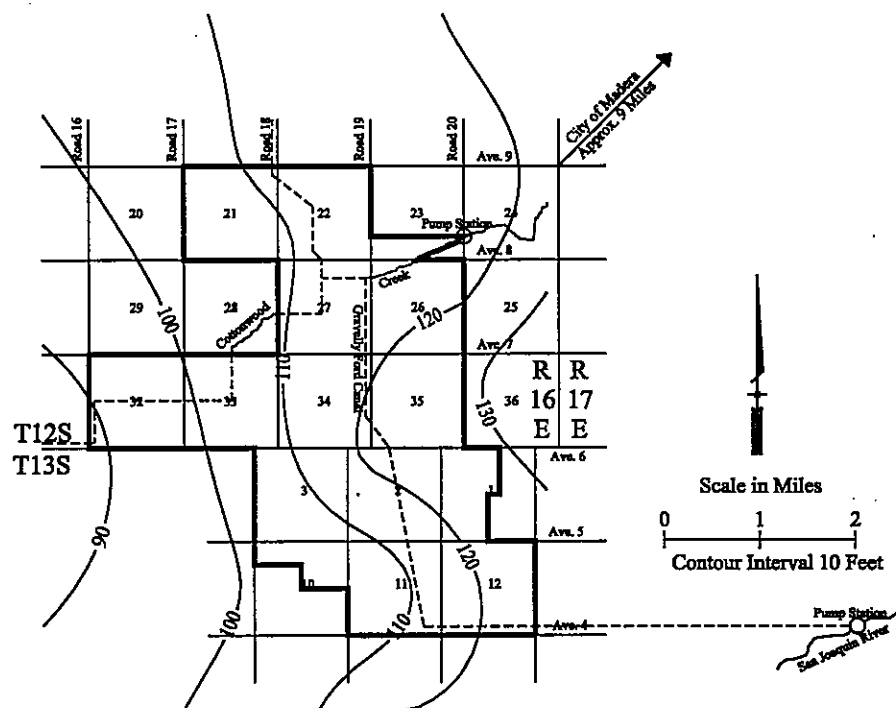


Figure 8
Groundwater Elevation in Feet Above MSL, Spring 1996

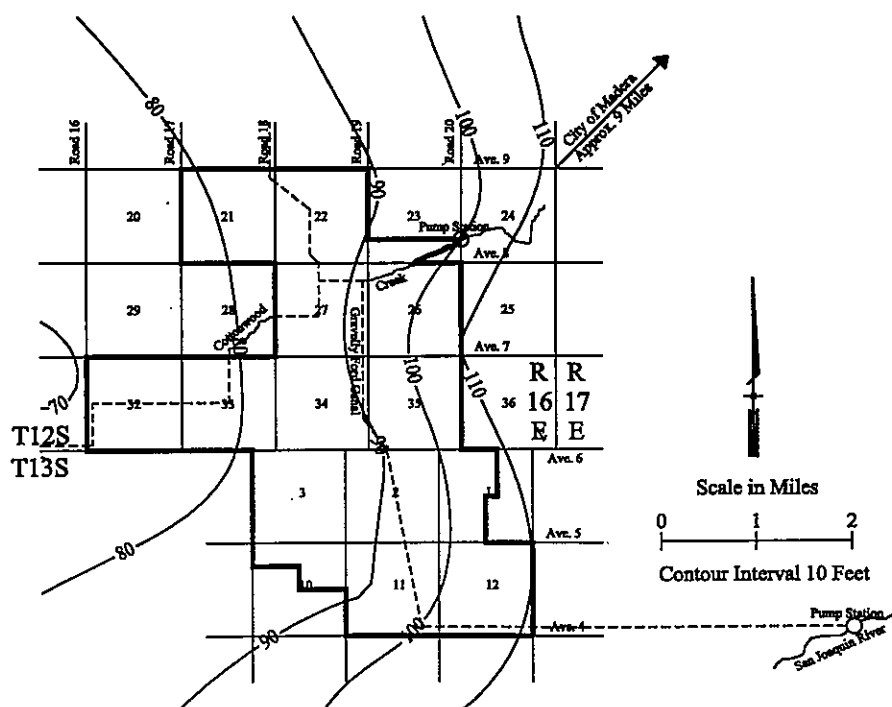
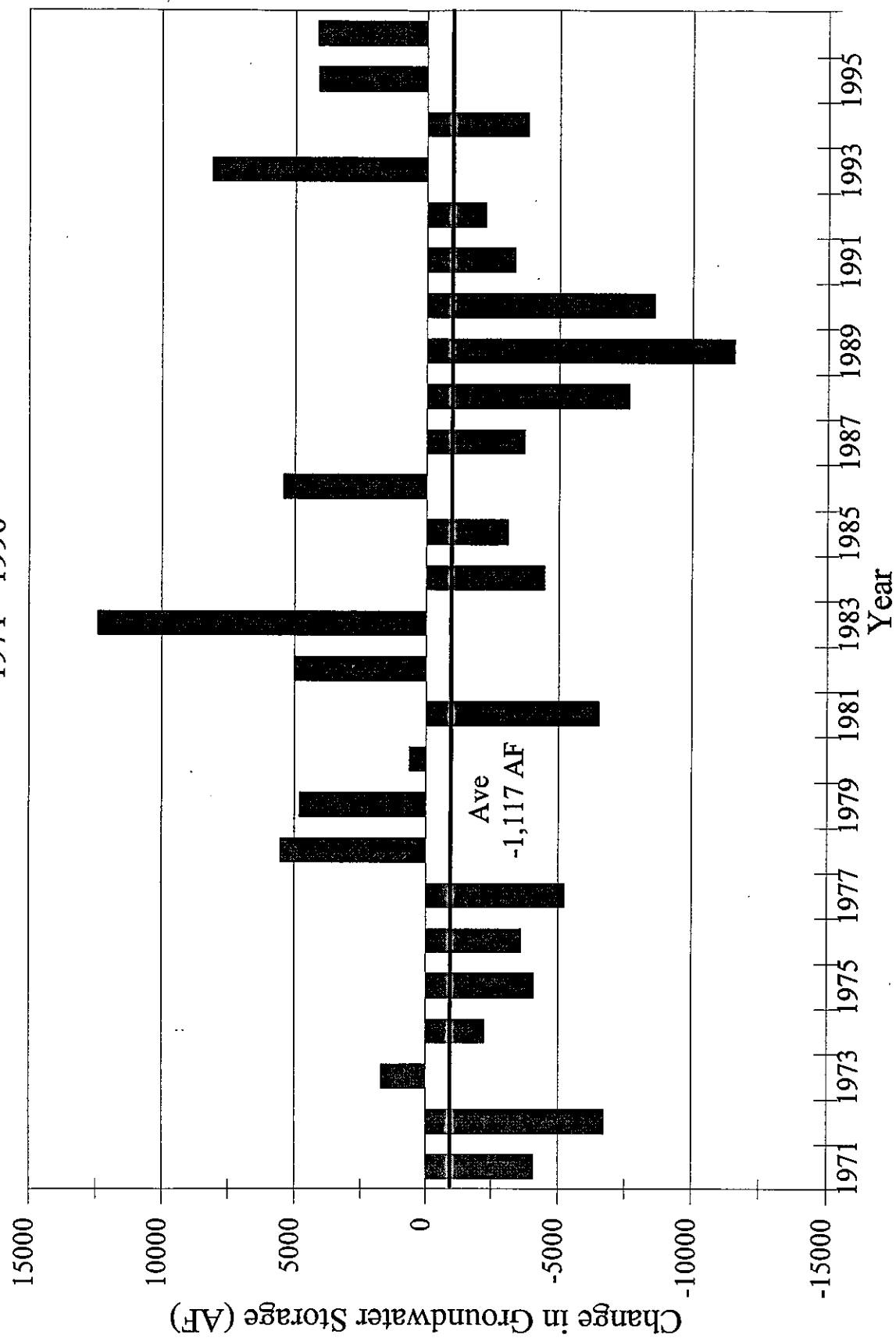


Figure 9
Change in Groundwater Storage
1971 - 1996



groundwater table. These depressions cause groundwater to flow from adjacent areas, influencing local groundwater movement.

3. Water Balance

The water balance for GFWD is intended to show how water is used in the district. It is not a indication of the overdraft in the district. The overdraft in the district is 1,117 AF per year as indicated by the change in storage. The values in Table 2 are the best estimates possible with the data available.

A. Inflow

i. Surface Water

The surface water available to GFWD is a feast or famine situation. This makes conjunctive use a critical element of GFWD's groundwater management. They currently have two contracts for surface water. The first is through the USBR for 14,000 AF of Class II water from the San Joaquin River. The second is a contract with MID for spill water in Cottonwood Creek. These inflows have averaged 14,801 AF. Figure 10 shows the annual surface water deliveries from 1957 through 1996.

ii. Effective Precipitation

Effective precipitation provides an annual average of 3,929 AF within GFWD. This provides about 22 percent of the average water demand. Figure 11 shows the annual effective precipitation from 1957 through 1996.

Table 2					
Water Balance					
	Crop ET	Surface Water	Effective Precipitation	Change in Groundwater Storage	*Subsurface Inflow
Year	AF	AF	AF	AF	AF
1971	17,712	4,090	2,373	(4,064)	(15,313)
1972	17,765	1,118	2,654	(6,701)	(20,694)
1973	17,818	9,592	4,930	1,708	(1,588)
1974	17,872	6,597	3,055	(2,270)	(10,490)
1975	18,087	10,441	2,446	(4,085)	(9,285)
1976	18,302	540	3,253	(3,588)	(18,097)
1977	18,517	209	2,487	(5,253)	(21,074)
1978	18,732	19,399	7,209	5,534	13,410
1979	18,947	17,243	4,067	4,820	7,183
1980	19,163	23,082	3,184	627	7,730
1981	19,378	2,638	3,935	(6,485)	(19,290)
1982	18,941	31,788	5,692	5,017	23,556
1983	18,504	4,102	7,490	12,438	5,526
1984	18,067	31,415	2,706	(4,494)	11,560
1985	17,629	5,511	2,716	(3,134)	(12,536)
1986	17,192	79,466	2,990	5,433	70,697
1987	16,755	1,216	3,804	(3,712)	(15,447)
1988	16,859	663	2,660	(7,647)	(21,183)
1989	16,963	646	2,023	(11,592)	(25,886)
1990	17,067	426	3,062	(8,602)	(22,181)
1991	17,172	2,472	3,606	(3,333)	(14,427)
1992	17,276	660	4,098	(2,243)	(14,761)
1993	17,380	46,332	5,065	8,133	42,150
1994	17,484	189	4,223	(3,846)	(16,918)
1995	17,588	46,530	5,910	4,116	38,968
1996	17,588	38,470	6,506	4,170	31,558
Sum	464,758	384,835	102,144	(29,053)	(6,832)
Min	16,755	189	2,023	(11,592)	(25,886)
Max	19,378	79,466	7,490	12,438	70,697
Avg	17,875	14,801	3,929	(1,117)	(263)

* Subsurface Inflow is a calculated value. () indicate a loss to GFWD

Figure 10
Surface Water Supply
1957 - 1996

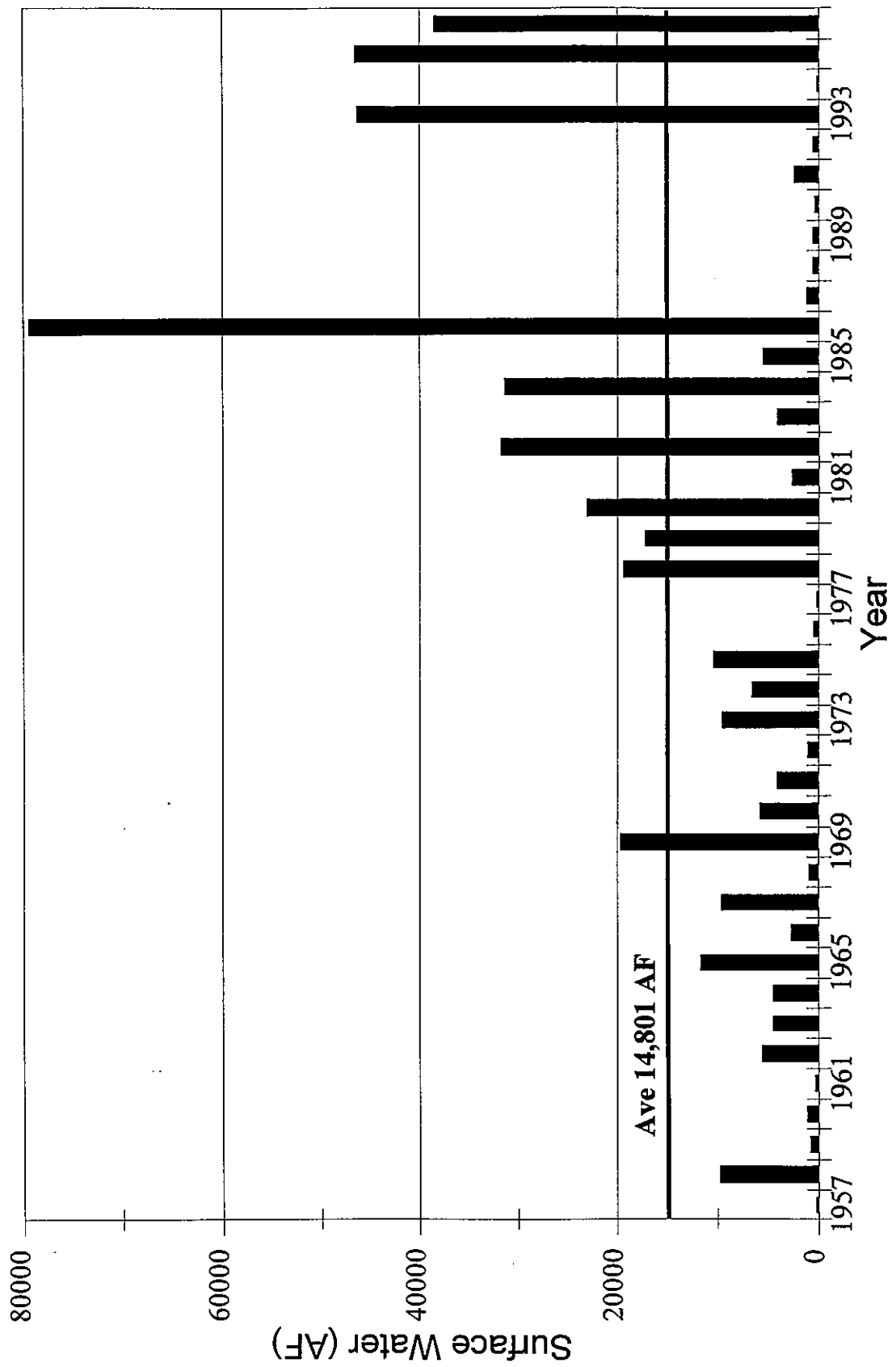
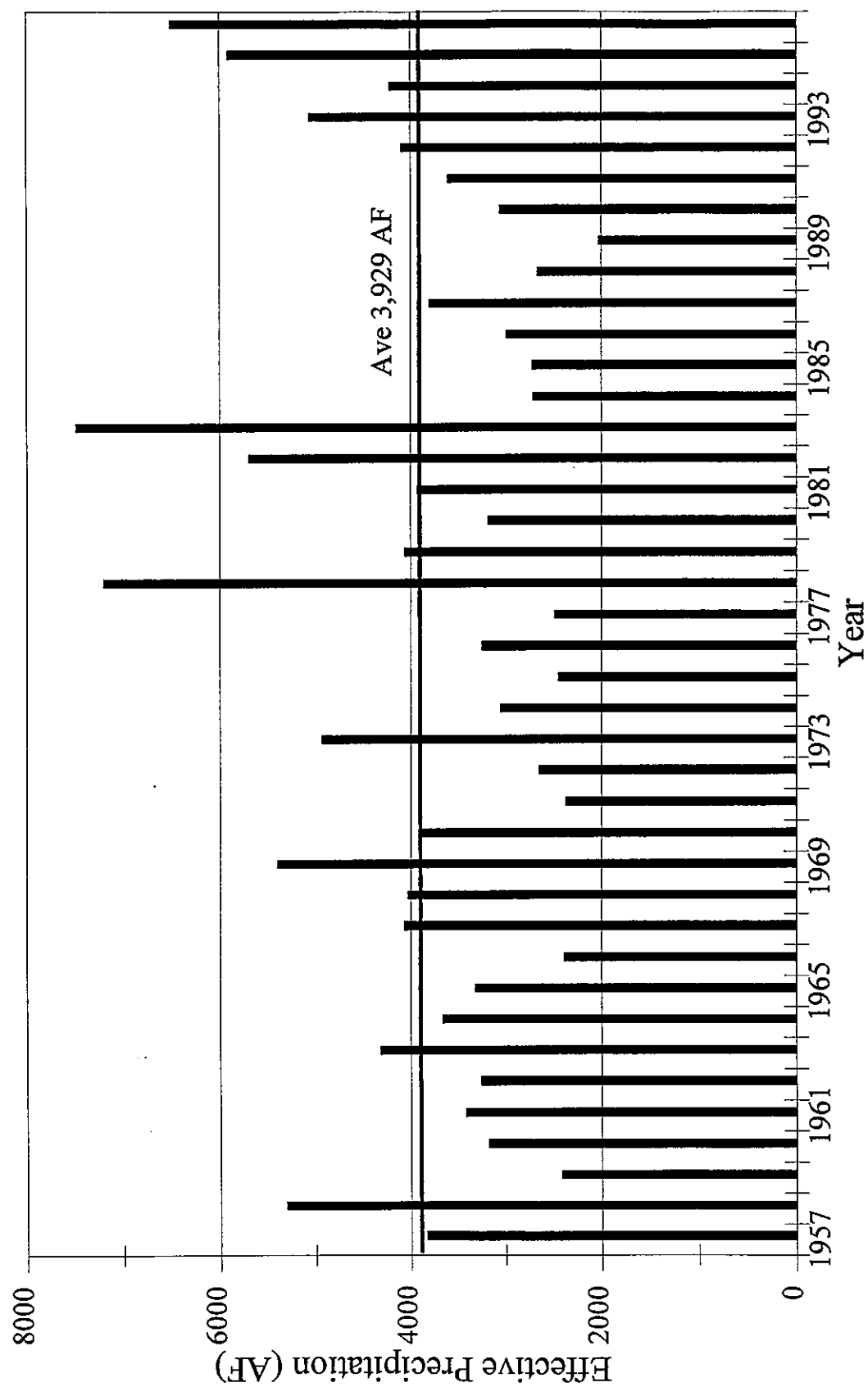


Figure 11
Effective Precipitation
1957 - 1996



B. Outflow

i. Evapotranspiration

Evapotranspiration is the method by which water is lost to the atmosphere by transpiration of a plant and evaporation from the soil surface in the vicinity of the plant. ET is the only significant component of water consumption in GFWD, peaking at 19,378 AF in 1981. The average ET demand for GFWD is 17,875 AF for the period between 1957 and 1996.

C. Changes in Storage

The average annual storage change for GFWD during the period from 1971 through 1996 is an overdraft of 1,117 AF, about eight percent of the average annual water demand. The change in storage varied from a decrease (overdraft) of 11,592 AF (1989) to a recharge of 12,438 AF (1983).

D. Estimated Subsurface Inflow

Data is not available to calculate the subsurface inflow into or out of GFWD. The subsurface inflow is calculated as the last unknown in our water balance. The sum of the five components: crop ET, effective precipitation, change in groundwater storage, surface water, and subsurface inflow must balance. We have calculated the inflows (effective precipitation, surface water deliveries, change in storage), and outflows (crop ET). The balance is the subsurface inflow. For the 26 year period from 1971 through 1996, the calculated annual subsurface flow averaged 263 AF out of the district.

IV. PLAN ITEMS

A successful groundwater management program does not have to include all plan items, but it is important that all items be specified and discussed in the event that they must be used. If funding is required for implementation of a plan item, an election shall be held with the majority of the votes determining if the proposition passes or fails. This list is not intended to be an exhaustive list and can be amended in the future as necessary.

In addition GFWD is a small district. The groundwater management of adjacent districts has a dramatic impact on the groundwater conditions within GFWD. It will be of the utmost importance to maintain a coordinated effort with neighboring districts. AB 3030 requires annual coordination meetings with other AB 3030 plan managers within the same groundwater basin.

1. Control of Saline Water Intrusion

There are no known occurrences of saline water intrusion within GFWD. With the establishment of a monitoring program, any intrusion can be identified. If an intrusion is identified, then at that time a plan will be developed to deal with the problem.

2. Identification and Management of Wellhead Protection and Recharge Areas

There are currently no municipal drinking water systems in GFWD, however, residents pump their drinking water from individually owned wells. Issues of wellhead protection for GFWD should be adequately covered by current county, state, and federal laws and regulations. If inadequacies are found, GFWD will work to cooperate with the appropriate agency in correcting the deficiency.

3. Regulation of the Migration of Contaminated Groundwater

GFWD's intent is not to take the responsibilities of any regulatory agency such as the State Water Resources Control Board (SWRCB) or U.S. Environmental Protection Agency. GFWD will however cooperate with the regulatory agencies to aid in maintaining the best practical quality water supply.

4. Administration of a Well Abandonment and Destruction Program

Wells that are improperly abandoned could lead to inappropriate materials contaminating the groundwater. Also, improperly abandoned wells can lead to interaquifer mixing.

The responsibility for administration and enforcement of a well abandonment and destruction program will be left with Madera County. The county has a program in place similar to the program explained in DWR bulletins 74-81 and 74-90.

5. Mitigation of Conditions of Overdraft

Reducing the ET requirements of the area by fallowing land or taking land out of production would definitely reduce groundwater pumping. Doing so is controversial and this type of program would be voluntary. Also, some analysis would need to be conducted to determine the impact that land fallowing, retirement, crop pattern changes or limiting pump extractions would have on the economy, both directly and with multiplier effects taken into consideration. The goal of this plan is to effectively manage groundwater with the smallest impact to current farming practices.

A. Land Fallowing

A certain number of acres could be fallowed (i.e. not planted or irrigated) each year. For example, assuming an average water use per acre of 3.0 AF, overdraft could be reduced by 300 AF by fallowing 100 acres. Participation in this type of program would be voluntary. A method of compensation would be developed for this type of action.

B. Change to Lower Water-use Crop

Water intensive crops such as alfalfa (48 inches/year), almonds (38 inches/year) or stone fruit (38 inches/year) could gradually be replaced by crops using less water, such as vineyards (for raisins), grains, and vegetables.

C. Land Retirement

Another option for reducing the overall ET of the area is to permanently take some land out of production. Growers volunteering to retire some or all of their acreage would be compensated through a plan that remains to be developed.

D. Limiting Pump Extractions

It is highly unlikely that groundwater "management" would come down to this. It is to prevent state or federal actions such as this that GFWD is preparing a local plan. Any pumping restrictions would be the last resort in preventing further overdraft and would have to be approved by a majority vote. Pumping restrictions would, however, definitely restrict groundwater use and could prevent overdraft.

6. Replenishment of Extracted Groundwater

Currently GFWD uses its distribution system as a recharge facility. The development of additional replenishment facilities would require significant capital and resources. Any replenishment project for GFWD would require three decisions, where to get supplemental water, how to use the supplemental water, and how to distribute the water. Due to the aforementioned questions, any replenishment program would require feasibility studies, design and construction prior to implementation. Following are some possibilities to be investigated.

A. Potential Water Sources

i. Cottonwood Creek

If the additional Cottonwood Creek water contract is obtained it will have a big impact on the future decision making for GFWD. This contract could bring the district into a balanced groundwater situation.

ii. San Joaquin River Flood Waters

It is possible that San Joaquin River flood waters could be obtained and recharged.

iii. Other Flood Waters

Another possibility is to obtain flood waters from other sources throughout California, municipal runoff or local small watersheds and use them for groundwater recharge.

iv. Imported Water

Surface water could be imported from outside GFWD and used for irrigation instead of pumping.

v. Reclaimed Water

Treated wastewater could be obtained from municipalities and used for recharge.

vi. Water Banking

Agreements could be made with other entities for the storage of groundwater in the available groundwater storage space of GFWD. The benefit to GFWD is that a minimum balance could be required before the recharging agency can remove anything, and they can only withdraw a predefined fraction of what they deposit, two-thirds for example.

B. Use of Additional Water

Basically, two options exist for the use of additional water: recharging it directly using percolation basins, or irrigating with it.

i. Recharge Basins

As previously mentioned, any other water source could be used to fill recharge basins and directly recharge the groundwater.

ii. Irrigation Deliveries (In-Lieu Recharge)

Any additional water obtained by GFWD could be used directly for irrigation water, reducing the amount of pumping. This is known as "in-lieu" or indirect recharge, since the water that would have been pumped to meet irrigation needs is effectively recharged as it stays in the ground.

7. Monitoring Groundwater Levels and Quality

GFWD plans to begin a program of groundwater monitoring for quantity and quality as soon as possible. This program will supplement the depth to groundwater monitoring that is done by the USBR and MID ensuring accurate assessments of the changes in groundwater storage. It is desirable to have a monitoring well about every two square miles. This would require the addition of about four monitored wells within GFWD. Sporadic water quality monitoring has taken place in the past but no routine monitoring program has been established. It is important to begin such a program to establish whether or not the water supply for this area is in a process of slow degradation. The test should be a general agricultural water quality test. The data obtained from the water quality tests should be compared to the 1970 USGS report to determine if any changes groundwater quality have occurred.

8. Facilitating Conjunctive Use

GFWD manages its resources with a system of conjunctive use. The district uses their surface water allotment for in-lieu recharge during the growing season. They are also able to use Gravelly Ford Canal to recharge available flood waters when there are no irrigation demands. This is the backbone of GFWD's groundwater management.

9. Well Construction Policies

Madera County currently regulates well construction policies in the county. These duties will be retained and administered by the county under this plan.

10. Construction and Operation of Groundwater Management Facilities

As implementation of the groundwater management plan progresses the design and construction of projects will be necessary. These processes will include conforming to all necessary environmental laws (CEQA) and public finance requirements. Funding for these types of projects would include a public vote and a method of equitable payment. Prior to these phases, feasibility studies would be completed and presented to GFWD.

11. Relationships with State and Federal Regulatory Agencies

The development of relationships with state and federal regulatory agencies will be an important part of an ongoing groundwater management plan. For starters, this plan will be submitted to DWR. The water level and quality monitoring may also be reported to them on a regular basis.

12. Land Use Plans

A program will be implemented for review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination and depletion.

V. RECOMMENDED GROUNDWATER MANAGEMENT PROGRAM

1. Program

GFWD is recommending the immediate implementation of the following items of the groundwater management plan into a groundwater management program:

- Actively pursue Cottonwood Creek Water Contract.
- Develop relationships with regulatory agencies and other groundwater management agencies within the Madera Basin.
- Monitoring and reporting of groundwater levels and quality.
- Establishment of an education/information program on groundwater including annual estimates of overdraft and safe yield.
- Begin investigations and feasibility studies of other options listed in plan beginning with replenishment of extracted groundwater.

2. Fees

As the level of effort in the management programs increase to design and construction the determination of who will pay and how much will be determined at that time. If general assessments are required and are outside the current powers of the districts, but within the powers of AB 3030 it may be necessary to hold public elections for the approval of groundwater management assessments.

3. Time Lines

Upon adoption of the groundwater management plan the following time line will be put into place:

- Develop relationships with other agencies immediately.
- Begin educational efforts within 6 months.
- Begin monitoring programs within one year.
- Begin initial feasibility studies within two years.
- Complete recharge feasibility studies within 5 years.

4. No Action

If no action is taken towards active groundwater management for GFWD it is anticipated that the following results will occur:

A. Water Table Continues to Fall

As the groundwater table continues to fall it may become uneconomical to grow certain crops. As the groundwater levels drop the pumping costs will rise. Additionally a falling water table may lead to the lowering of pumps, developing newer and deeper wells, land relevening due to land subsidence, etc.

B. Adjudication

It's quite possible that if nothing is done to improve the groundwater situation that another agency will intervene to limit pumping to the basin's safe yield through adjudication.

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GLOSSARY OF TERMS

Note: the definitions presented are not all-inclusive but are presented for the benefit of the reader of this report. The terms included may have other broader definitions that do not apply to this report and are not presented here.

Active Recharge-- see Recharge, Active

Acre-Foot -- A unit of water volume equal to 43,560 cubic feet or approximately 325,800 gallons.

Alluvial Fan-- A gradually sloping mass of sands and clays which are deposited by slow moving water entering a plane.

Aquifer-- A ground-bearing formation that is sufficiently permeable to transmit and yield water in usable quantities; usually composed of gravel, sand, or other coarse-textured particles.

Confined Aquifer-- A formation in which the groundwater is isolated from the atmosphere at the point of discharge by impermeable geologic formations. A confined aquifer is usually subject to pressure greater than atmospheric.

Conjunctive Use-- The planned joint use of surface and groundwater to improve the reliability, economic and firm yield of the total water resource.

Crop Water Demand-- Estimated evapotranspiration of a field or region.

Drawdown-- The distance between the static water level and the pumping water level in a well. It is a measure of the force required to drive water into a well.

Effective Rainfall-- The amount of rain that can actually be used by a crop to meet evapotranspiration requirements.

Evapotranspiration (ET)-- The method by which water is lost to the atmosphere by transpiration of a plant and evaporation from the soil surface in the vicinity of the plant.

Groundwater (as defined by AB 3030)-- All water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water.

Groundwater Basin-- Any basin defined in DWR Bulletin 118-80.

Groundwater Management Plan-- A document that describes activities intended to be investigated to stabilize and/or improve groundwater conditions within a defined area.

Groundwater Management Program-- Coordinated and on-going activities undertaken for the purpose of implementing the Groundwater Management Plan.

Hydraulic Conductivity-- The measure of how effectively groundwater moves through a porous media (soil or aquifer), expressed as feet per day.

In-Lieu Recharge-- see Recharge, In-Lieu

Overdraft--The volume of water removed from an aquifer or similar holding basin that is greater than the amount entering that aquifer or holding basin..

Passive Recharge-- see Recharge, Passive

Permanent Crops--Agricultural plants such as grape vineyards and fruit or nut trees that are not replanted on an annual or bi-annual basis.

Plan-- see Groundwater Management Plan

Program--see Groundwater Management Program

Root Zone-- The strata of soil immediately below the ground surface that contains plant roots; the portion of soil that can hold water for use by crops.

Recharge, Active-- Any of various means of intentionally causing surface water to percolate into the groundwater table in order to increase the volume of water stored in the groundwater table, such as percolation ponds or basins, flood storage basins, intentional over-irrigation, routing flood and irrigation water through unlined canals, etc.

Recharge, In-Lieu-- Intentionally using water sources besides groundwater (such as flood water, surface water, or imported water) in order to avoid making extractions from the groundwater table.

Recharge, Passive-- Any of various means in which surface water, through no effort of man, percolates into the groundwater table such as seepage from rivers, lakes, canals, and rainwater; lateral flow

Seepage-- The process of water flowing through soil pore spaces, primarily due to the force of gravity.

Specific Yield--The ratio of the volume of water that a given aquifer will yield by gravity to that aquifer's volume, usually expressed as a percent.

Static Water Level-- The level of water in a well that is not being affected by withdrawal of groundwater.

Subsurface Flow-- The flow of groundwater through a porous media (aquifer) that exits a defined boundary.

Unconfined Aquifer-- An aquifer that is not restricted from above by an impermeable layer or other formation and in which the water contained is under the pressure exerted by the overlying atmosphere and water. The water table in an unconfined aquifer will fluctuate with extraction and recharge.

Vadose Zone-- An unsaturated portion of the soil between the ground surface and the water table.

Water Balance-- A method of accounting for the quantity of water that enters, exits and is stored within a defined boundary.

Water Banking-- A technique by which an entity, such as a water district, stores water in the groundwater storage space of another entity, to be extracted in the future.

Water Table--The surface between the vadose zone and the groundwater; that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

Well Field-- A group of wells used to pump groundwater for delivery to users.

Well Yield-- The volume of water per unit of time discharged from a well, either by pumping or free flow. It is commonly measured as a pumping rate in gallons per minute per foot of drawdown.

APPENDIX A
Resolution of Intention

GRAVELLY FORD WATER DISTRICT

Notice is hereby given that the Board of Directors of the Gravelly Ford Water District held a public hearing on August 11, 1997 to consider adoption of a Resolution of Intention to draft a groundwater management plan for Gravelly Ford Water District. At the conclusion of the hearing, the following resolution was adopted:

BEFORE THE BOARD OF DIRECTORS
OF THE GRAVELLY FORD WATER DISTRICT
MADERA COUNTY, CALIFORNIA
RESOLUTION OF INTENTION OF THE GRAVELLY FORD WATER DISTRICT TO
DRAFT A GROUNDWATER MANAGEMENT PLAN

WHEREAS, all the lands which are contained within the boundaries of the legal description of the Gravelly Ford Water District as of August 11th, 1997, including Sections 21, 22, 26, 27, 32, 33, 34, 35 and a portion of Section 23 in Township 12 S, Range 16 E, MDB&M, and Sections 2, 3, 11, 12, and portions of Sections 1 and 10 in Township 13 S, Range 16 E, MDB&M; and

WHEREAS, it is in the best interest of the District and the landowners within the District to investigate and develop a plan for the long term management of the groundwater resources within the District in order to protect the availability of groundwater for continued use in future years; and

WHEREAS, the California State Legislature has authorized the District, and other local public entities, to develop and adopt groundwater management plans pursuant to Water Code sections 10750 et seq.

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors intends to draft a plan for the management of groundwater resources lying beneath Gravelly Ford Water District. The process for the development of the draft groundwater management plan shall consider the relationship of groundwater resource availability and utilization within the Gravelly Ford Water District and adjacent areas. Such draft plan shall be acted upon within two (2) years from the date of this resolution, after further public hearing in accordance with the provisions of Section 10750, et seq., of the California Water Code.

THE ABOVE RESOLUTION was passed and adopted by the following vote of the Board of Directors of the Gravelly Ford Water District this 11th day of August, 1997.

AYES: Directors Keating, Andrew, Schafer, DaSilva

NOES: None

ABSENT: Basila

/s/James Keating
President

ATTEST:
/s/Timothy DaSilva
Secretary

BEFORE THE BOARD OF DIRECTORS
OF THE GRAVELLY FORD WATER DISTRICT
MADERA COUNTY, CALIFORNIA

RESOLUTION OF INTENTION OF THE GRAVELLY FORD WATER DISTRICT TO
DRAFT A GROUNDWATER MANAGEMENT PLAN

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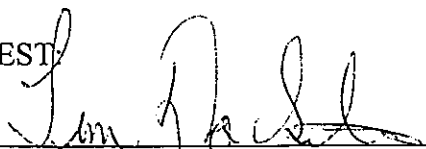
THE ABOVE RESOLUTION was passed and adopted by the following vote of the Board of Directors of the Gravelly Ford Water District this 11th day of August, 1997.

AYES: Directors Keating, Andrew, Schafer, DaSilva, Basila

NOES: None

NOES: None

ATTEST


Secretary


President

APPENDIX B

Madera Basin



State of California
The Resources Agency

Department of
Water Resources



Ground Water Basins in California

A Report to the Legislature
in Response to
Water Code Section 12924

Bulletin 118-80
January 1980

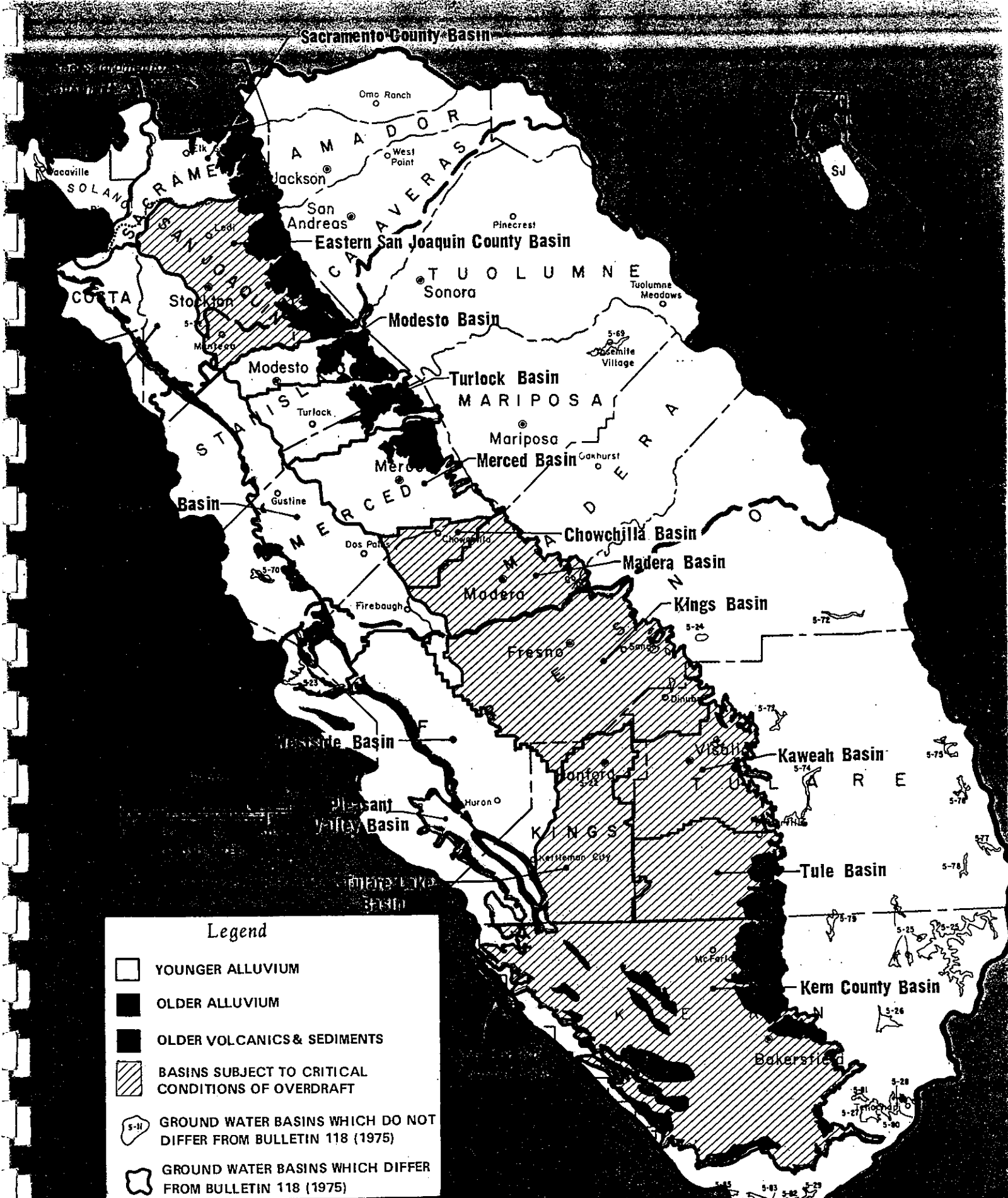


Figure 10

GROUND WATER BASINS, SAN JOAQUIN BASIN HYDROLOGIC STUDY AREA

Turlock Basin. The Turlock Basin lies between the Tuolumne and Merced Rivers and is bounded on the west by the San Joaquin River and on the east by the Sierra Nevada foothills. The basin includes lands in the Turlock Irrigation District, the Ballico-Cortez Water District, and the unincorporated Montpelier area.

Tracy Basin. The basin includes all San Joaquin Valley older and younger alluvium in Contra Costa and Santa Clara Counties and that portion of San Joaquin County west of the San Joaquin River.

Merced Basin. The basin includes lands south of the Merced River between the San Joaquin River on the west and the Sierra Nevada foothills on the east. The proposed basin boundary on the south stretches westerly along the Madera-Merced County line and the southern boundary of the Le Grand-Athlone Water District, then along the northern boundaries of the La Branza Water District, Sections 14 and 15 in Township 9 South, Range 14 East, and the El Nido Irrigation District. The southern boundary of the basin then follows the western boundary of El Nido Irrigation District south to the northern boundary of the Sierra Water District, which is followed westerly to the San Joaquin River.

Chowchilla Basin. The Chowchilla Basin includes lands in Madera and Merced Counties. The basin is bounded on the west by the San Joaquin River and the eastern boundary of the Columbia Canal Company Service Area and on the north by the southern boundary of the Merced Basin. The southern boundary from west to its connection with the northern boundary runs along the southern boundary of Township 11 South, Range 14 East, and the southern boundary of Progressive Water District, northerly along the eastern boundaries of Progressive Water District and Sections 9 and 16 of Township 11 South, Range 15 East, and northeasterly along the southern and eastern boundaries of Chowchilla Water District, then northeasterly following Berenda Slough and Ash Slough to the Chowchilla River.

Madera Basin. The Madera Basin consists of lands overlying the alluvium in Madera County. The basin is bounded on the south by the San Joaquin River; on the west by the eastern boundary of the Columbia Canal Company Service Area; on the north by the south boundary of the Chowchilla Basin; and on the east by the Sierra Nevada foothills.

Delta-Mendota Basin. The Delta-Mendota Basin lies for the most part west of the San Joaquin River, and covers those lands receiving surface water from the Delta-Mendota Canal. The northern boundary is the northern boundary of Stanislaus County, the eastern boundary is the San Joaquin River south to the northern boundary of the Columbia Canal Company Service Area. The Delta-Mendota Basin takes in all of the Columbia Canal

BEFORE
THE BOARD OF DIRECTORS
OF THE
GRAVELY FORD WATER DISTRICT
STATE OF CALIFORNIA
ORDINANCE NO. 2-2000

AN ORDINANCE ADDING RULES AND REGULATIONS
RELATING TO GROUNDWATER EXPORTATION,
GROUNDWATER BANKING, AND IMPORTATION OF
FOREIGN WATER

The Board of Directors of the Gravelly Ford Water District ("Board"), County of Madera, State of California, ordains as follows:

SECTION 1:

**GROUNDWATER EXPORTATION, GROUNDWATER BANKING, IMPORTATION OF
FOREIGN WATER, AND USE OF DISTRICT FACILITIES FOR SUCH PURPOSES**

Chapter .100

**Rules and Regulations Pertaining to Groundwater Banking; Importation of Foreign
Water For the Purpose of Groundwater Banking; Exportation of Groundwater
Outside the District; and Use of District Facilities for such Purposes.**

.100.010 PURPOSE AND INTENT.

- A. The lands within Gravelly Ford Water District ("District") are heavily dependent upon groundwater. The groundwater basin(s) underlying the District and surrounding areas are severely overdrafted.
- B. It is essential to the continued prosperity of the landowners and water users within the District that the quality and quantity of the groundwater supply be maintained to meet the demands of District landowners and water users.
- C. Areas within the District are or could be or become subject to land subsidence due to the extraction of groundwater.
- D. The direct or indirect transfer of groundwater outside the District may have significant environmental impacts on the area within the District including, but not limited to, increased groundwater overdraft; land

subsidence; uncontrolled movement of contaminated groundwater; uncontrolled movement of poor quality groundwater; the lowering of groundwater levels; increased groundwater degradation.

- E. The direct or indirect transfer of groundwater outside the District may have significant economic impacts on areas within the District including, but not limited to, loss of arable agricultural land; increased pumping costs due to lowered groundwater levels; increased groundwater quality treatment costs due to movement of contaminated or poor quality groundwater; replacement of wells due to declining groundwater levels, and replacement of damaged wells, conveyance facilities, roads, bridges and other structures due to land subsidence.
- F. The direct or indirect transfer of groundwater outside the District could have significant environmental impacts on areas within the District including, but not limited to, increased groundwater overdraft; land subsidence; uncontrolled movement of contaminated groundwater; uncontrolled movement of inferior quality groundwater; the lowering of groundwater levels; increased groundwater degradation; and loss of aquifer capacity due to land subsidence.
- G. The importation of water originating outside of Madera County (whether or not conveyed through or pooled with facilities located in or adjacent to Madera County) for the purpose of Groundwater Banking such water ("Foreign Water") could, if unregulated, introduce water of an inferior quality into District aquifers, resulting in significant economic and environmental impacts on areas within the District, including, but not limited to, those specified in Paragraphs D. and E., above .
- H. As used herein the term "Groundwater Banking" means the

percolation, injection, or other recharge of a supply of water for the purpose of later extraction and delivery of such water outside of the District. Groundwater Banking can be reasonable and beneficial if it can be accomplished without:

- (1) causing or increasing an overdraft of groundwater underlying the District;
- (2) adversely affecting the ability of other groundwater users to use, store, or transmit groundwater within any aquifer(s) underlying the District (for example by utilizing storage that might otherwise be subject to natural or passive recharge and thus depriving other groundwater users of their use of the aquifer and the groundwater derived therefrom) ;
- (3) adversely affecting the reasonable and beneficial uses of groundwater by other groundwater users within the District;
- (4) resulting in, expanding, or exacerbating degradation of the quality or quantity of surface or groundwater within the District, or groundwater basins and aquifers within the District;
- (5) resulting in injury to a water replenishment, storage, restoration, or conveyance project or facility;
- (6) adversely affecting the surface or subsurface of neighboring or nearby lands, or the trees, vines, or crops growing or to be grown thereon;
- (7) adversely affecting the economy or environment of the area within the District; or
- (8) adversely affecting the storage ability on adjacent lands where passive recharge may take place.

- I. For Groundwater Banking projects all or a portion of which will be located within the District, it is essential that the District be the agency that determines whether a permit should be issued to allow Groundwater Banking, exportation of groundwater, or importation of Foreign Water, within such areas. Without a permit process which allows public notice, public hearings, and compliance with environmental and other appropriate requirements, there would be no or inadequate local control over such Groundwater Banking, exportation of groundwater, or importation of Foreign Water, nor a method to insure that Groundwater Banking will meet the requirements of Paragraph I., above.
- J. The District, as the agency most familiar with local conditions affecting groundwater, should adopt reasonable regulatory measures in relation to exportation of groundwater, Groundwater Banking, and the importation of Foreign Water for the purpose of Groundwater Banking.
- K. California Water Code Section 1810(d) provides that use of a water conveyance facility to transfer water may be denied if the use of the water conveyance facility will injure any legal user of water, will unreasonably affect fish, wildlife or other in-stream beneficial uses, or will unreasonably affect the overall economy or the environment of the county from which the water is being transferred.

.100.020 TITLE.

These provisions shall be known as "Rules and Regulations Pertaining to Groundwater Banking; Importation of Foreign Water For the Purpose of Groundwater Banking; Exportation of Groundwater Outside the District; and Use of District Facilities for such Purposes."

.100.030 LAND SUBJECT TO ARTICLE.

This Chapter shall be applicable to all lands within the District boundaries. If a portion of a Groundwater Banking project lies within the District, and a portion lies outside the boundaries of the District, then this Chapter shall apply to that portion that lies within the boundaries of the District.

SECTION .100.040 EXPORTATION OF GROUNDWATER BEYOND DISTRICT BOUNDARIES.

A. REQUIREMENT OF PERMIT:

Except under a permit granted pursuant to this Section, no groundwater extracted from any well within the boundaries of the District and located on or under lands subject to this Chapter, shall be used on lands which are outside of the boundaries of the District, unless the lands on which the water is being used are contiguous to the lands where the water is extracted, and are owned by the same landowner.

A permit is required under this Section whether or not such exportation is pursuant to Groundwater Banking that is also subject to a separate permit under Section __.100.050. A permit for exportation under this Section may cover all exportation of water to a specified water user in amounts specified in the permit for a period not to exceed five years from the granting of the permit, after which a new permit shall be required.

B. APPLICATION FOR PERMIT:

Applications for permits under this Section shall be made to the

District Engineer on forms provided by the District Engineer and shall contain all information and reports required therein. An Application shall be accompanied by a report ("Report") prepared at the applicant's expense by a qualified Registered Civil Engineer or Geologist, versed in geologic and hydraulic testing, which shows:

- a. The source of the water to be exported.
- b. The quantity and quality of water proposed to be exported.
- c. The location to which and purpose for which the water is to be exported, including the reasonable and beneficial use to which the water is to be put.
- d. The geologic and hydrologic properties of the aquifers from which extraction will be made, including possibilities or likelihood of subsidence problems.
- e. Percolation tests to determine the ability of the aquifer(s) to recharge.
- f. Clay layers and their effect on percolation.
- g. The applicant's Project Water Measurement and Water Loss Accountability Plan.
- h. The applicant's Damage Prevention Plan.
- i. The applicant's Project Monitoring Plan.
- j. The applicant's Safety Action Plan.
- k. The applicant's Emergency Action Plan.
- l. The location, size, spacing and depths of extraction wells.
- m. Horizontal migration of groundwater from surrounding locations.
- n. The effect on surrounding lands and their groundwater supplies.
- o. Such other matters as the District Engineer may require.

Five copies of the Application, Report, and other information submitted shall be provided.

C. ENVIRONMENTAL IMPACT REPORT:

An Application for extraction permit under this Section is deemed to be a "project" under the California Environmental Quality Act ("CEQA") and its implementing regulations ("CEQA Guidelines").

In order to ensure that decision-makers have sufficient information on the potential impacts of such a project, the preparation and certification of an Environmental Impact Report ("EIR") is hereby required for each such project application. The EIR must conform to CEQA, CEQA Guidelines, and all District requirements. The EIR shall be prepared, and shall be paid for by the applicant, in accordance with the District's CEQA implementation procedures.

D. ADDITIONAL STUDIES AND REQUIREMENTS:

If, after receiving the Report as required by Paragraph B., above, and before or after receiving the EIR, the District Engineer desires more information, he or she may require preparation by applicant, at applicant's expense, of any additional geologic or hydrologic studies, or other information or studies, that he or she deems necessary to obtain information needed in order to make a recommendation on the application. The Engineer may review the application with potentially affected landowners and water users, with the staff of applicable local, state and federal agencies and with, and with the Madera County Water Oversight Committee.

E. REVIEW OF APPLICATION.

After reviewing the Application, Report, Environmental Impact Report, and any additional studies and other information required under Paragraph D., above, the District Engineer shall prepare a written report, with all comments attached thereto, in which he

or she either shall recommend denial of the permit, or granting the permit with suggested conditions for the project. The written report also shall include recommendations concerning the adequacy of the EIR. All documents shall be filed with the Secretary of the Board.

F. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD:

The permit may only be approved if the District finds that the proposed extraction and exportation will not have detrimental impacts on the District by determining that:

- (1) The extraction and exportation will not cause or increase an overdraft on parts or all of the groundwater basins underlying the District.
- (2) The extraction and exportation will not adversely affect the ability of other groundwater users to use, store, or transmit groundwater within any aquifer(s) underlying the District.
- (3) The extraction and exportation will not adversely affect the reasonable and beneficial uses of groundwater by other groundwater users within the District.
- (4) The extraction and exportation will not result in, expand, or exacerbate degradation of the quality or quantity of surface or groundwater within the District, or groundwater basins and aquifers within the District.
- (5) The extraction and exportation will not result in injury to a water replenishment, storage, restoration, or conveyance project or facility;
- (6) The extraction and exportation will not adversely affect the overall economy or environment of the area within the District.

If the Board determines that one or more of the findings required by this Section cannot be made, the Board shall deny the permit application. The basis for any such denial shall be reflected in the Board's official record of proceedings.

G. RE-APPLICATION AFTER BOARD DENIAL:

Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

H. PAYMENT OF FEES.

The applicant at the time of filing shall pay such fees as are or may be established by the Board for processing the application and the giving and publication of required notices.

I. NOTICE TO LANDOWNERS:

Upon the filing of an application with the District Engineer, the District Engineer shall give written notice to all owners of lands located within five miles of the exterior boundaries of the proposed extraction site, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District Engineer. In addition thereto, the District Engineer shall cause to be published pursuant to Government Code §§ 6060 and 6061.3 a notice that the application has been filed, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in

connection with the application are public records subject to inspection at the office of the District Engineer. The District Engineer shall retain one copy of the application documents, EIR, and any comments or reports thereon and make them available for public inspection and copying in accordance with the Public Records Act.

J. NOTICED PUBLIC HEARING:

No permit shall be issued without a noticed public hearing before the Board pursuant to Government Code §§ 6060 and 6061.3. The notice shall be given by the Secretary of the Board after completion and filing of the Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, the location from which the water is proposed to be extracted and exported, and a general description of the project and that any interested person may submit evidence at the hearing. At least fifteen days must elapse between filing the documents with the Secretary of the Board and the date of the hearing.

K. PROCEDURES FOR CONDUCTING HEARING:

At the hearing, the Application, Report, Environmental Impact Report, additional submittals, comments from the public and the Engineer's Recommendation shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

L. DECISION AFTER HEARING.

At the conclusion of the hearing, the Board shall approve the

application and grant the permit if the Board makes the findings set forth in Paragraph F., above, subject to the terms and provisions authorized in Paragraph M., below. If the Board is unable to make the findings set forth in Paragraph F., above, then the application shall be denied and no permit shall be issued. The Board shall direct that written findings are prepared in conformity with its decision and shall adopt said findings when prepared.

M. TERMS AND CONDITIONS OF PERMIT:

If an application is approved, the Board may impose such terms and conditions thereon as the Board deems necessary to prevent adverse effects on the aquifer(s), the quality and quantity of the groundwater supply, adjacent or neighboring lands, or the environment.

N. REVOCATION OF PERMIT:

Any violation of the terms and conditions of the permit will constitute grounds for revocation of the permit after a duly noticed public hearing thereon held in the manner described in the preceding Paragraphs.

O. INSPECTIONS:

If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the District Engineer, or his representatives, at any reasonable time, and from time to time, to enter the project site and make such observations and measurements as are deemed necessary to assure that the project is being carried out under the terms of the permit.

P. DECISION OF BOARD FINAL:

The decision of the Board in any matter set forth herein, other than criminal penalties, shall be final upon its adoption of written findings.

Q. JUDICIAL REVIEW:

Any judicial action to set aside, annul, or vacate any decision or action taken by the Board pursuant to this Chapter shall be filed pursuant to California Code of Civil Procedure Section 1094.5 and within the time limits prescribed in California Code of Civil Procedure section 1094.6.

SECTION .100.050 GROUNDWATER BANKING.

A. REQUIREMENT OF PERMIT:

No person, who is subject to this Ordinance, other than the District, shall engage in Groundwater Banking on or under land subject to this Ordinance without first obtaining a permit from the District in accordance with this Section. A permit for Groundwater Banking under this Section may cover all Groundwater Banking for amounts of storage specified in the permit for a period not to exceed five years from the granting of the permit, after which a new permit shall be required. A permit for Groundwater Banking is not a permit for importation of Foreign Water to the Groundwater Bank (which importation shall require a separate permit under Section __.100.060), and it is not a permit for exportation of groundwater beyond District boundaries (which exportation shall require a separate permit under Section __.100.040).

B. APPLICATION FOR PERMIT:

Applications for permits under this Section shall be made to the District Engineer on forms provided by the District Engineer and shall contain all information and reports required therein. An Application shall be accompanied by a report ("Report") prepared at the applicant's expense by a qualified Registered Civil Engineer or Geologist, versed in geologic and hydraulic testing, which shows:

- a. The location, plans, and specifications of the proposed project.
- b. The quantity of water proposed to be imported, and the quality standards thereof, including possibilities or likelihood of contamination or degradation problems.
- c. The quantities of groundwater to be extracted.
- d. The geologic and hydrologic properties of the aquifers into which recharge will occur and from which extraction will be made, including possibilities or likelihood of subsidence problems.
- e. Percolation tests to determine the ability of the aquifer(s) to recharge.
- f. Clay layers and their effect on percolation.
- g. Design of spreading areas.
- h. The applicant's Operations and Maintenance Plan.
- i. The applicant's Project Water Measurement and Water Loss Accountability Plan.
- j. The applicant's Damage Prevention Plan.
- k. The applicant's Project Monitoring Plan.
- l. The applicant's Safety Action Plan.
- m. The applicant's Emergency Action Plan.
- n. The location, size, spacing and depths of extraction wells.
- o. Horizontal migration of groundwater from surrounding locations.
- p. The effect on surrounding lands and their groundwater supplies.

- q. Such other matters as the District Engineer may require.

Five copies of the Application, Report, and other information submitted shall be provided.

C. ENVIRONMENTAL IMPACT REPORT:

An Application for Groundwater Banking under this Section is deemed to be a project under the California Environmental Quality Act ("CEQA") and its implementing regulations ("CEQA Guidelines"). In order to ensure that decision-makers have sufficient information on the potential impacts of such a project, the preparation and certification of an Environmental Impact Report ("EIR") is hereby required for each such project application. The EIR must conform to CEQA, CEQA Guidelines, and all District requirements. The EIR shall be prepared, and shall be paid for by the applicant, in accordance with the District's CEQA implementation procedures.

D. ADDITIONAL STUDIES AND REQUIREMENTS:

If, after receiving the Report as required by Paragraph B., above, and before or after receiving the EIR, the District Engineer desires more information, he or she may require preparation by applicant, at applicant's expense, of any additional geologic or hydrologic studies, or other studies or information, that he or she deems necessary to obtain information needed in order to make a recommendation on the application. The Engineer may review the application with potentially affected landowners and water users, with the staff of applicable local, state and federal agencies, and with the Madera County Water Oversight Committee.

E. REVIEW OF APPLICATION.

After reviewing the Application, Report, Environmental Impact Report, and any additional studies and other information required under Paragraph D., above, the District Engineer shall prepare a written report, with all comments attached thereto, in which he or she either shall recommend denial of the permit, or granting the permit with suggested conditions for the project. The written report also shall include recommendations concerning the adequacy of the EIR. All documents shall be filed with the Secretary of the Board.

F. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD:

The permit may only be approved if the District finds that the proposed Groundwater Banking project will not have detrimental impacts on the District by determining that:

- (1) The project will not adversely affect the ability of other groundwater users to use, store, or transmit groundwater within any aquifer(s) underlying the District (for example by utilizing storage that might otherwise be subject to natural or passive recharge and thus depriving other groundwater users of their use of the aquifer and the groundwater derived therefrom).
- (2) The project will not adversely affect the reasonable and beneficial uses of groundwater by other groundwater users within the District.
- (3) The project will not result in, expand, or exacerbate degradation of the quality or quantity of surface or groundwater within the District, or groundwater basins and aquifers within the District.
- (4) The project will not result in injury to a water replenishment,

storage, restoration, or conveyance project or facility.

(5) The project will not adversely affect the surface or subsurface of neighboring or nearby lands, or the trees, vines, or crops growing or to be grown thereon.

(6) The project will not adversely affect the overall economy or environment of the District.

(7) The project will not cause or increase an overdraft of groundwater underlying the District.

(8) The project will not adversely affect the storage ability on adjacent lands where passive recharge may take place. If the Board determines that one or more of the findings required by this Section cannot be made, the Board shall deny the permit application. The basis for any such denial shall be reflected in the Board's official record of proceedings.

G. RE-APPLICATION AFTER BOARD DENIAL:

Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

H. PAYMENT OF FEES.

The applicant at the time of filing shall pay such fees as are or may be established by the Board for processing the application and the giving and publication of required notices.

I. NOTICE TO LANDOWNERS:

Upon the filing of an application with the District Engineer, the District Engineer shall give written notice to all owners of lands located within the District which are located within five miles of project site, setting forth the name of the applicant, a description

of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District Engineer. In addition thereto, the District Engineer shall cause to be published pursuant to Government Code §§ 6060 and 6061.3 a notice that the application has been filed, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District Engineer. The District Engineer shall retain one copy of the application documents, EIR, and any comments or reports thereon and make them available for public inspection and copying in accordance with the Public Records Act.

J. NOTICED PUBLIC HEARING:

No permit shall be issued without a noticed public hearing before the Board pursuant to Government Code §§ 6060 and 6061.3. The notice shall be given by the Secretary of the Board after completion and filing of the Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, a general description of the proposed importation and that any interested person may submit evidence at the hearing. At least fifteen days must elapse between filing the documents with the Secretary of the Board and the date of the hearing.

K. PROCEDURES FOR CONDUCTING HEARING:

At the hearing, the Application, Report, Environmental Impact

Report, additional submittals, comments from the public and the Engineer's Recommendation shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

L. DECISION AFTER HEARING.

At the conclusion of the hearing, the Board shall approve the application and grant the permit if the Board makes the findings set forth in Paragraph F., above, subject to the terms and provisions authorized in Paragraph M., below. If the Board is unable to make the findings set forth in Paragraph F., above, then the application shall be denied and no permit shall be issued. The Board shall direct that written findings are prepared in conformity with its decision and shall adopt said findings when prepared.

M. TERMS AND CONDITIONS OF PERMIT:

If an application is approved, the Board may impose such terms and conditions thereon as the Board deems necessary to prevent adverse effects on the aquifer(s), the quality and quantity of the groundwater supply, adjacent or neighboring lands, or the environment. Since direct or other subsurface injection of water into an aquifer entails an inherent risk of irreparable contamination due to the lack of natural filtering resulting from percolation, the permit shall prohibit the use of direct or other subsurface injection.

N. REVOCATION OF PERMIT:

Any violation of the terms and conditions of the permit will

constitute grounds for revocation of the permit after a duly noticed public hearing thereon held in the manner described in the preceding Paragraphs.

O. INSPECTIONS:

If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the District Engineer, or his representatives, at any reasonable time, and from time to time, to enter the project site(s) and make such observations and measurements as are deemed necessary to assure that the project is being carried out under the terms of the permit.

P. DECISION OF BOARD FINAL:

The decision of the Board in any matter set forth herein, other than criminal penalties, shall be final upon its adoption of written findings.

Q. JUDICIAL REVIEW:

Any judicial action to set aside, annul, or vacate any decision or action taken by the Board pursuant to this Chapter shall be filed pursuant to California Code of Civil Procedure Section 1094.5 and within the time limits prescribed in California Code of Civil Procedure Section 1094.6.

**SECTION .100.060 IMPORTATION OF FOREIGN WATER FOR
GROUNDWATER BANKING.**

A. REQUIREMENT OF PERMIT:

Except under a permit granted pursuant to this Section, no person

may import Foreign Water for the purpose of Groundwater Banking within the boundaries of the District and located on or under lands subject to this Chapter. A permit is required under this Section whether or not such importation is pursuant to Groundwater Banking that is also subject to a separate permit under Section __.100.050. A permit for importation under this Section may cover all importation of water from a specified water source (designated by specific location and type) in amounts specified in the permit for a period not to exceed five years from the granting of the permit, after which a new permit shall be required.

B. APPLICATION FOR PERMIT:

Applications for permits under this Section shall be made to the District Engineer on forms provided by the District Engineer and shall contain all information and reports required therein. An Application shall be accompanied by a report ("Report") prepared at the applicant's expense by a qualified Registered Civil Engineer or Geologist, versed in geologic and hydraulic testing, which shows:

- a. The source of the water to be imported.
- b. The quantity and quality of water proposed to be imported.
- c. The manner in which the water is to be conveyed to the Groundwater Banking facility, including the specific location of conveyance facilities, and copies of all permits and agreements showing consent for the use of such conveyance facilities.
- d. The physical, and where applicable the geologic and hydrologic, properties of the conveyance facilities, including possibilities or likelihood of contamination or degradation problems.
- e. The applicant's Project Water Measurement and Water Accountability Plan.
- f. The applicant's Damage Prevention Plan.
- g. The applicant's Project Monitoring Plan.

- h. The applicant's Safety Action Plan.
- i. The applicant's Emergency Action Plan.
- j. The effect on lands surrounding or neighboring all conveyance facilities and on their groundwater or surface water supplies.
- k. The effect on all other water supplies into which the proposed Foreign Water may be commingled while being conveyed, such as in a pool or reservoir.
- l. Such other matters as the District Engineer may require.

Five copies of the Application, Report, and other information submitted shall be provided.

C. ENVIRONMENTAL IMPACT REPORT:

An Application for Foreign Water Importation Permit under this Section is deemed to be a "project" under the California Environmental Quality Act ("CEQA") and its implementing regulations ("CEQA Guidelines"). In order to ensure that decision-makers have sufficient information on the potential impacts of such a project, the preparation and certification of an Environmental Impact Report ("EIR") is hereby required for each such project application. The EIR must conform to CEQA, CEQA Guidelines, and all District requirements. The EIR shall be prepared, and shall be paid for by the applicant, in accordance with the District's CEQA implementation procedures.

D. ADDITIONAL STUDIES AND REQUIREMENTS:

If, after receiving the Report as required by Paragraph B., above, and before or after receiving the EIR, the District Engineer desires more information, he or she may require preparation by applicant, at applicant's expense, of any additional geologic or hydrologic studies, or other studies or information, that he or she deems

necessary to obtain information needed in order to make a recommendation on the application. The Engineer may review the application with potentially affected landowners and water users, with the staff of applicable state and federal agencies, and with the Madera County Water Oversight Committee.

E. REVIEW OF APPLICATION.

After reviewing the Application, Report, Environmental Impact Report, and any additional studies and other information required under Paragraph D., above, the District Engineer shall prepare a written report, with all comments attached thereto, in which he or she either shall recommend denial of the permit, or granting the permit with suggested conditions for the project. The written report also shall include recommendations concerning the adequacy of the EIR. All documents shall be filed with the Secretary of the Board.

F. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD:

The permit may only be approved if the District finds that the proposed importation of Foreign Water will not have detrimental impacts on the District by determining that:

- (1) The importation will not adversely affect the ability of other groundwater users to use, store, or transmit groundwater within any aquifer(s) underlying the District.
- (2) The importation will not adversely affect the reasonable and beneficial uses of groundwater by other groundwater users within the District.
- (3) The importation will not result in, expand, or exacerbate

degradation of the quality or quantity of surface or groundwater within the District, or groundwater basins and aquifers within the District.

(4) The importation will not result in injury to a water replenishment, storage, restoration, or conveyance project or facility.

(5) The project will not adversely affect the surface or subsurface of neighboring or nearby lands, or the trees, vines, or crops growing or to be grown thereon.

(6) The importation will not adversely affect the overall economy or environment of the District.

(7) The existing qualities of the underground aquifers will not be degraded by the importation.

(8) The importation will not adversely affect the storage ability on adjacent lands where passive recharge may take place.

If the Board determine that one or more of the findings required by this Section cannot be made, the Board shall deny the permit application. The basis for any such denial shall be reflected in the Board's official record of proceedings.

G. RE-APPLICATION AFTER BOARD DENIAL:

Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

H. PAYMENT OF FEES.

The applicant at the time of filing shall pay such fees as are or may be established by the Board for processing the application and the giving and publication of required notices.

I. NOTICE TO LANDOWNERS:

Upon the filing of an application with the District Engineer, the District Engineer shall give written notice to all owners of lands located within the District which are located within five miles of any conveyance facilities that are within or adjacent to the District, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District Engineer. In addition thereto, the District Engineer shall cause to be published pursuant to Government Code §§ 6060 and 6061.3 a notice that the application has been filed, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District Engineer. The District Engineer shall retain one copy of the application documents, EIR, and any comments or reports thereon and make them available for public inspection and copying in accordance with the Public Records Act.

J. NOTICED PUBLIC HEARING:

No permit shall be issued without a noticed public hearing before the Board pursuant to Government Code §§ 6060 and 6061.3. The notice shall be given by the Secretary of the Board after completion and filing of the Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, a general description of the proposed

importation and that any interested person may submit evidence at the hearing. At least fifteen days must elapse between filing the documents with the Secretary of the Board and the date of the hearing.

K. PROCEDURES FOR CONDUCTING HEARING:

At the hearing, the Application, Report, Environmental Impact Report, additional submittals, comments from the public and the Engineer's Recommendation shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

L. DECISION AFTER HEARING.

At the conclusion of the hearing, the Board shall approve the application and grant the permit if the Board makes the findings set forth in Paragraph F., above, subject to the terms and provisions authorized in Paragraph M., below. If the Board is unable to make the findings set forth in Paragraph F., above, then the application shall be denied and no permit shall be issued. The Board shall direct that written findings are prepared in conformity with its decision and shall adopt said findings when prepared.

M. TERMS AND CONDITIONS OF PERMIT:

If an application is approved, the Board may impose such terms and conditions thereon as the Board deems necessary to prevent adverse effects on the aquifer(s), the quality and quantity of the groundwater supply, adjacent or neighboring lands, or the environment.

N. REVOCATION OF PERMIT:

Any violation of the terms and conditions of the permit will constitute grounds for revocation of the permit after a duly noticed public hearing thereon held in the manner described in the preceding Paragraphs.

O. INSPECTIONS:

If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the District Engineer, or his representatives, at any reasonable time, and from time to time, to enter the project site(s) and make such observations and measurements as are deemed necessary to assure that the project is being carried out under the terms of the permit.

P. DECISION OF BOARD FINAL:

The decision of the Board in any matter set forth herein, other than criminal penalties, shall be final upon its adoption of written findings.

Q. JUDICIAL REVIEW:

Any judicial action to set aside, annul, or vacate any decision or action taken by the Board pursuant to this Chapter shall be filed pursuant to California Code of Civil Procedure Section 1094.5 and within the time limits prescribed in California Code of Civil Procedure section 1094.6.

SECTION .100.070 DISTRICT CONVEYANCE FACILITIES:

A. REQUIREMENT OF PERMIT:

In order to avoid injury to any legal user of water, and to avoid unreasonably affecting the overall economy or the environment of Madera county, no person may use any District-owned conveyance facility as a part of, or in connection with, Groundwater Banking for which a permit is required under this Chapter, or the importation of Foreign Water for which a permit is required under this Chapter, or the exportation of groundwater for which a permit is required under this Chapter, except under a permit granted pursuant to this Section. A permit is required under this Section whether or not such use is in connection with groundwater banking, importation of foreign water, or exportation of groundwater for which a separate permit or permits are required under other Sections of this Chapter. A permit for use of a district conveyance facility under this Section may cover all importation of water from a specified water source (designated by specific location and type) in amounts specified in the permit for a period not to exceed two years from the granting of the permit, after which a new permit shall be required.

B. APPLICATION FOR PERMIT:

Applications for permits under this Section shall be made to the District Engineer on forms provided by the District Engineer and shall contain all information and reports required therein. An Application shall be accompanied by a report ("Report") prepared at the applicant's expense by a qualified Registered Civil Engineer or Geologist, versed in geologic and hydraulic testing, which shows:

- a. The source of the water to be conveyed through the conveyance facility.
- b. The quantity and quality of water proposed to be conveyed.
- c. The manner in which the water is to be delivered to and withdrawn from the District conveyance facility

and how the water is to conveyed from its source to the District's conveyance facility.

- d. The physical, and where applicable the geologic and hydrologic, properties of the conveyance facilities through which the water will be delivered into the District's conveyance facilities, including possibilities or likelihood of contamination or degradation problems.
- e. The applicant's Project Water Measurement and Water Accountability Plan.
- f. The applicant's Damage Prevention Plan.
- g. The applicant's Project Monitoring Plan.
- h. The applicant's Safety Action Plan.
- i. The applicant's Emergency Action Plan.
- j. The effect on lands within the District and otherwise surrounding or neighboring all conveyance facilities and on their groundwater or surface water supplies.
- k. The effect on all other water supplies with which the water proposed to be conveyed may be commingled while being conveyed.
- l. The effect of the use of the District conveyance facility on any other legal user of water conveyed or to be conveyed through such facilities.
- m. The effect of the use of the District conveyance facility on fish, wildlife, other instream beneficial uses, or the environment within the District and within Madera County.
- n. The effect of the use of the District conveyance facility on the economy within the District and within Madera County.
- o. Such other matters as the District Engineer may require.

Five copies of the Application, Report, and other information submitted shall be provided.

C. ENVIRONMENTAL IMPACT REPORT:

An Application for Use of District Conveyance Facility under this Section is deemed to be a "project" under the California Environmental Quality Act ("CEQA") and its implementing

regulations ("CEQA Guidelines"). In order to ensure that decision-makers have sufficient information on the potential impacts of such a project, the preparation and certification of an Environmental Impact Report ("EIR") is hereby required for each such project application. The EIR must conform to CEQA, CEQA Guidelines, and all District requirements. The EIR shall be prepared, and shall be paid for by the applicant, in accordance with the District's CEQA implementation procedures.

D. ADDITIONAL STUDIES AND REQUIREMENTS:

If, after receiving the Report as required by Paragraph B., above, and before or after receiving the EIR, the District Engineer desires more information, he or she may require preparation by applicant, at applicant's expense, of any additional physical, geologic or hydrologic studies, or other studies or information, that he or she deems necessary to obtain information needed in order to make a recommendation on the application. The Engineer may review the application with potentially affected landowners and water users, with the staff of applicable state and federal agencies, and with the Madera County Water Oversight Committee.

E. REVIEW OF APPLICATION.

After reviewing the Application, Report, Environmental Impact Report, and any additional studies and other information required under Paragraph D., above, the District Engineer shall prepare a written report, with all comments attached thereto, in which he or she either shall recommend denial of the permit, or granting the permit with suggested conditions for the project. The written report also shall include recommendations concerning the

adequacy of the EIR. All documents shall be filed with the Secretary of the Board.

F. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD:

The permit may only be approved if the District finds that the proposed use of District conveyance facility will not:

- (1) Injure any legal user of water.
- (2) Unreasonably affect fish, wildlife, or other instream beneficial uses.
- (3) Unreasonably affect the overall economy of the county from which the water is to be transferred.
- (4) Unreasonably affect the environment of the county from which the water is to be transferred.

If the Board determines that one or more of the findings required by this Section cannot be made, the Board shall deny the permit application. The basis for any such denial shall be reflected in the Board's official record of proceedings.

G. RE-APPLICATION AFTER BOARD DENIAL:

Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

H. PAYMENT OF FEES.

The applicant at the time of filing shall pay such fees as are or may be established by the Board for processing the application and the giving and publication of required notices.

I. NOTICE TO LANDOWNERS:

Upon the filing of an application with the District Engineer, the District Engineer shall give written notice to all owners of lands located within the District which are located within five miles of any conveyance facilities that are within or adjacent to the District, setting forth the name of the applicant, a description of the applicant's proposal, a description or map of the District facility involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District Engineer. In addition thereto, the District Engineer shall cause to be published pursuant to Government Code §§ 6060 and 6061.3 a notice that the application has been filed, setting forth the name of the applicant, a description of the applicant's proposal, a description or map of the District facility involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District Engineer. The District Engineer shall retain one copy of the application documents, EIR, and any comments or reports thereon and make them available for public inspection and copying in accordance with the Public Records Act.

J. NOTICED PUBLIC HEARING:

No permit shall be issued without a noticed public hearing before the Board pursuant to Government Code §§ 6060 and 6061.3. The notice shall be given by the Secretary of the Board after completion and filing of the Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, a general description of the proposed importation and that any interested person may submit evidence

at the hearing. At least fifteen days must elapse between filing the documents with the Secretary of the Board and the date of the hearing.

K. PROCEDURES FOR CONDUCTING HEARING:

At the hearing, the Application, Report, Environmental Impact Report, additional submittals, comments from the public and the Engineer's Recommendation shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

L. DECISION AFTER HEARING.

At the conclusion of the hearing, the Board shall approve the application and grant the permit if the Board makes the findings set forth in Paragraph F., above, subject to the terms and provisions authorized in Paragraph M., below. If the Board is unable to make the findings set forth in Paragraph F., above, then the application shall be denied and no permit shall be issued. The Board shall direct that written findings are prepared in conformity with its decision and shall adopt said findings when prepared.

M. TERMS AND CONDITIONS OF PERMIT:

If an application is approved, the Board may impose such terms and conditions thereon as the Board deems necessary to prevent adverse effects described in Paragraph F, above.

N. REVOCATION OF PERMIT:

Any violation of the terms and conditions of the permit will constitute grounds for revocation of the permit after a duly noticed public hearing thereon held in the manner described in the preceding Paragraphs.

O. INSPECTIONS:

If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the District Engineer, or his representatives, at any reasonable time, and from time to time, to enter the applicant's site(s) and make such observations and measurements as are deemed necessary to assure that the applicant's proposed use is being carried out under the terms of the permit.

P. DECISION OF BOARD FINAL:

The decision of the Board in any matter set forth herein, other than criminal penalties, shall be final upon its adoption of written findings.

Q. JUDICIAL REVIEW:

Any judicial action to set aside, annul, or vacate any decision or action taken by the Board pursuant to this Chapter shall be filed pursuant to Cal. Code of Civil Procedure Section 1094.5 and within the time limits prescribed in Cal. Code of Civil Procedure section 1094.6.

SECTION .100.080 PENALTIES FOR VIOLATION:

These rules and regulations are enacted to secure distribution of water in

accordance with determined rights within the District pursuant to California Water Code Section 22085. Supervision and enforcement of these regulations shall be by District watermasters appointed under Water Code Section 22081. The District may elect to proceed with any or all of the following remedies for violation of this Chapter:

- (a) A civil action against the violator for damages and/or injunctive relief.
- (b) A misdemeanor criminal action against any violator who willfully and without authority closes, changes, or interferes with any headgate, waterbox, or measuring device while it is under the control of the watermaster, or who willfully takes, uses, or conveys water which has been denied him by the watermaster as not allowed under permit or in violation of the provisions of this Ordinance is guilty of a misdemeanor pursuant to Water Code Section 22088. Under Water Code Section 22089.5, a watermaster has the power to arrest any person violating any of the provisions of this article and to give him into the custody of the sheriff or other competent police officer within the county, and immediately thereafter make a complaint before a magistrate against the person so arrested. Every person who violates any of the provisions of this article is guilty of a misdemeanor and is punishable by a fine of not less than twenty-five dollars (\$25), nor more than two hundred fifty dollars (\$250), or by imprisonment in the county jail for not less than 10 days nor more than six months, or by both such fine and imprisonment pursuant to Water Code Section 22089.
- (c) A referral to the Madera County District Attorney for prosecution of a misdemeanor criminal action against any violator without authority of the owner or managing agent, and with intent to defraud, take water from any canal, ditch, flume, or reservoir used for the purpose of holding or conveying is guilty of a misdemeanor under California Penal Code

Section 592. If the total retail value of all the water taken is more than four hundred dollars (\$400), or if the defendant has previously been convicted of an offense under Penal Code Section 592 or any former section that would be an offense under Section 592, or of an offense under the laws of another state or of the United States that would have been an offense under this section if committed in this state, then the violation is punishable by imprisonment in the county jail for not more than one year, or in the state prison.

.100.090 SEVERABILITY:

If any section, subsection, sentence, clause or phrase of this Chapter is for any reason held to be illegal, invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions hereof. The Board hereby declares it would have passed this Chapter and each section, subsection, sentence, clause or phrase hereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses or phrases are declared illegal, invalid or unconstitutional.

SECTION 2:

This Ordinance shall take effect and be in force thirty (30) days after its adoption.

ATTACHMENT

H

The District sends information memos to all landowners and water users. District has advised growers of availability of Mobil Lab services for farm water efficiency solutions. District also advises water users of availability of CIMIS data which is accessible on the internet and is given on the local radio station every morning.

Gravelly Ford Water District
1836 West 5th Street
Madera, California 93607

April 27, 2009

To: Gravelly Ford Water District Landowners and Water Users
From: Don Roberts, Manager
Re: 2009 Water Supply Season

1. The 2009 water supply for the Friant unit is currently at 100% Class 1 and 0% Class 2. This is what I would call a "dry" year. The District's water supply is only for Class 2 water from the San Joaquin River. The District is able to contract for excess flows in the San Joaquin River if and when they exist. It is anticipated there will be very limited, if any, water available from this source. The Bureau made channel modifications downstream from Friant and they are able to control their releases to the point where excess flow at Gravelly Ford is minimal.

The District also contracts for "spill" water from Madera Irrigation District in Cottonwood Creek and from their Lat. 6.2. No water is expected in Cottonwood Creek and a very limited amount may be available from the Lat. 6.2.

Every effort will be made to make any supply available to as many growers as possible

2. Crop Water Applications: Each eligible water user must have completed a Crop Water Application and RRA forms before any water delivery can occur. For those properties that are rented or leased, both Parties must have a completed crop water application and RRA forms prior to any water delivery.

3. Water Price. The 2009 price for delivered Cost of Service water is currently set at \$40 per acre foot. Full cost water is set at \$45.

4. Madera Irrigation District will be starting water on May 4 and Gravelly Ford will try to mirror their season.

The District's ditchender is Joe Boentello and he can be reached at (559)706-4892 for water orders (starts and stops).

For questions about the District's water supply and/or operations, you may call me at (559)474-1000.

Enclosure: Crop Water Application

Will go out Monday
E.



GRAVELLY FORD WATER DISTRICT

1836 West Fifth Street, Madera, CA 93637 (559)674-5581

June 17, 2009

TO: Landowners/Water Users

FROM: Don Roberts, Manager

RE: 2009 Water Supply

This has been an unusual water year to say the least. Water supply has been all over the map. During much of May, the District was able to obtain some Class 2 water which we made available to you on a limited basis. Even though Friant Dam was slipping over the top, the Bureau of Reclamation feels that the District should pay for a seepage loss in the river.

During the last few years, the District enjoyed the benefit of a delivery problem the Bureau had downstream from Friant which required larger releases to serve some riparian lands east of Highway 41. This condition gave us residual spill water at our pumps that provided us with a regular water supply. Last August, the Bureau made some modifications to the river channel which eliminated the surplus downstream flow.

Because of the variation in daily river flow, the District is unable to sustain any type of efficient deliverable flow within our canal system. During the first 14 days in June, the District could deliver to growers only 1/3 of the water received into the District system from the river and Madera Irrigation District spills. This gives the District a significant negative cash flow. To break even for just the cost of water would require a water charge of \$70 per acre foot. This excludes ditchtender and power costs.

With the substantial negative cash flow looming if we continue under these conditions, the District has decided to halt scheduled water deliveries for the remainder of the 2009 water season. If conditions change, we will advise you immediately. The District is sorry for the interruption in our deliveries, but economics requires this decision.

Any water taken from the District system will be billed.

Please feel free to contact me if you have any questions.

Don Roberts
559-474-1000

Irrigation Tech-Line

Farm Water Efficiency

Evaluating Irrigation Systems Pays Off For Growers



Friant Water Authority / J. Randall McFarland
North West Kern Resources Conservation District General Manager Brian Hockett checks pressure in a manifold line as he evaluates micro-irrigation system uniformity.

Eastern San Joaquin Valley agriculture has spent the past two decades eagerly embracing techniques and tools for farm irrigation efficiency but that is only part of the challenge.

Keeping systems operating at peak effectiveness is an ongoing task that is not only a sound objective. It's a necessity.

FRIANT SERVICE

To help keep micro-irrigation systems and components in tip-top condition by detecting problems, Friant Division growers and others who farm in parts of the south valley have available a low-cost public service.

Brian W. Hockett, North West Kern Resource Conservation District Manager, for 23 years has been taking a mobile laboratory into valley fields to analyze efficiency of all types of irrigation systems, including flood and border strip, furrow and different types of sprinklers. He also undertakes water audits.

"Predominately, I'm looking at drip and micro-sprinklers," Hockett said.

"More things go wrong in this type of system and there are more opportunities for correction." Most of those systems serve the valley's constantly expanding acreages of permanent crops.

His objective and that of the mobile lab

To Schedule A Mobile Lab Visit On Your Farm

Making arrangements for an in-the-field analysis of farm irrigation system efficiency is easy. Call Brian Hockett, North West Kern Resource Conservation District Manager, at (661) 336-0967, extension 138. His e-mail address is brian.hockett@ca.nacdn.net.

operation "is to help growers be as efficient as possible."

Resource Conservation Districts and their programs are services of the U.S. Department of Agriculture.

EVALUATIONS

For a \$100 fee charged by the district, Hockett examines and tests all parts of a grower's system, and prepares a thorough report for the farmer or farm manager — neatly bound — containing maps and data on water pressures along with problem areas and recommendations.

Under an agreement with the U.S. Bureau of Reclamation, North West Kern and Hockett provide evaluation services throughout the Central Valley Project's Friant Division.

The mobile lab made 118 on-farm
Please see **Mobile Lab**, back page



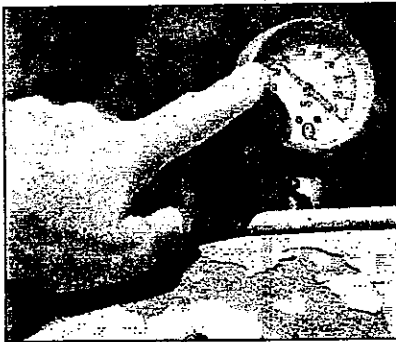
The "mobile lab" upon which Brian Hockett and the growers he serves with irrigation system evaluation includes an off-road vehicle and a variety of measuring and related equipment housed in a district pickup truck.

How Each System Is Evaluated

When Brian Hockett arrives in the field with his North West Kern Resource Conservation District mobile laboratory equipment to evaluate the farm's micro-irrigation system efficiency, he follows a fairly standard procedure that leads to one goal. "We're just out there doing what we can to help growers be more efficient," said Hockett.

AT THE START

He begins at the farm's on-site water source by examining the pumping plant's filter system and, if one is in use, the reservoir that is used to store water. Reservoirs also provide an opportunity for various impurities to settle to the bottom, acting as another guard against fouling the distribution system.



Friant Water Authority
Filter system pressures are a crucial part of a micro-system evaluation.

Looking over sand media filters at an almond orchard east of Wasco in Kern County, Hockett determines the pressure of water that has passed through filtration is about two pounds lower than the head-end reading. He also watches the filters as they flush to spot any problems. Hockett determines that these filters are clean and functioning as intended.

Around the filters, Hockett checks the pressure gauges before and after the filtration process.

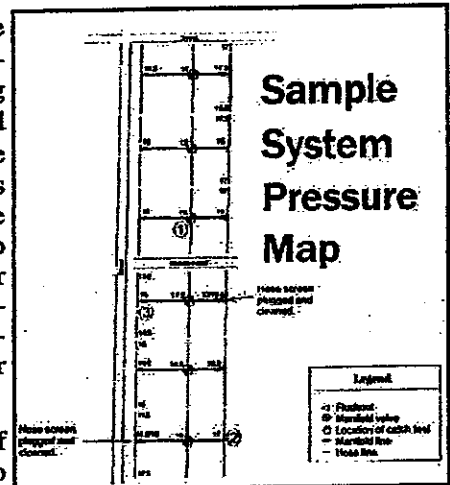
"This is where I start because if the filters are not performing properly, the grower is not going to get enough pressure to the field," he said.

Hockett maps the system and then begins testing, looking over each manifold and taking pressure readings at distances that increase from the filters. He takes into consideration whether the system is compensating or non-compensating for pressure fluctuations.

Uniformity of pressure is vital to achieve desired flow rates. "I'm checking to see that all of these manifolds are at a good pressure," Hockett said. If pressure drops below 8 pounds or less per square inch in a pressure compensating system, emitters are going to put out less water and the tree or vine will suffer.

He also tests pressure at many locations in hose lines and measures the amount of water actually being emitted throughout the field. Water is caught at locations with a high, a medium, and a low pressure to correlate changes in the flow rate with the changes in pressure. In the office, the data is plotted on a spreadsheet that a computerized program will later help analyze "what we really have." A formula is applied to help determine if water distribution uniformity has been achieved.

If there are problems, a follow-up evaluation is scheduled to determine if all the necessary corrections have been made.



Mobile Lab: Irrigation Tested

Continued from front page
visits last year, with 2-5 per week made during the summer, all on a grower-request basis. Each field and system evaluation requires about 2½ - 5 hours in the field, with another two hours in the office.

"These tests ideally should be made on each system about once every five years," said Hockett.

VITAL NEED

Growers installing micro-irrigation systems or operating existing systems quickly become aware that on-going inspection and maintenance are vital to ensure water is delivered as intended to plantings.

"As micro systems like this become

more prevalent and more people are keyed into it, they know what it takes," Hockett said.

Larger farm operations – many of which have their own irrigation department staffs – are generally better equipped to evaluate system efficiency along with routine inspections and maintenance than are smaller operators.

"Small farmers are doing everything," Hockett says.

No matter the size and scope of the farm, he notes that "irrigation is just one aspect of the overall farming operation but if you don't get the right amount of water on, it could have a big impact on the whole operation, because you won't be maximizing your yields."



Friant Water Authority / J. Randall McFarland
After using a catch device, Brian Hockett measures the water to help determine flow rates.

ATTACHMENT

I

CROP WATER APPLICATION

Phone No. _____

Turnout No. _____

Please mail to above address or fax to 559-673-1086.

WATER ORDER

START

☐

STOP

☐

CHANGE

☐

SWITCH

☐

USER _____

ORDERED BY _____

DATE _____ TIME _____

DITCH _____

T.O. NO. _____

REMARKS _____

DITCHTENDER _____ BY _____

DATE RECEIVED _____ TIME _____

ATTACHMENT

J

See attached report for water quality testing in Cottonwood Creek at Road 20 (eastern boundary of Gravelly Ford Water District) as provided by East San Joaquin Water Coalition

EAST SAN JOAQUIN WATER COALITION

Cottonwood Creek @ Road 20													
Date Sampled	Oxygen, Dissolved	pH	E. coli	Copper ¹	Lead ¹	Chlorpyrifos	Cyanazine	Diazinon	Diuron	Simazine	Fathead minnow toxicity	Algae toxicity	Sediment toxicity
	7 mg/L	6.5-8.5 units	235 MPN /100 mL	µg/L (variable)	µg/L (variable)	0.015 µg/L	1.0 µg/L	0.1 µg/L	2 µg/L	4.0 µg/L	Based on survival	Based on growth	Based on survival
2/16/2005			1600										
3/21/2005	5.6		1600										
5/10/2005			540										
6/14/2005	5.7												
7/12/2005	5.17												
8/16/2005			300										
9/20/2005	6.5												
2/28/2006			300										
3/15/2006			1600										
5/16/2006	5.71			4.4 (3.5)									
6/13/2006	6.9			8 (3.1)	0.73 (0.63)								
7/11/2006	6.51												
8/8/2006	6.95												
9/12/2006	6.11			5.5 (4.4)									
5/29/2007	6.55			6.7 (5.5)									
6/19/2007				6.7 (4.4)									
6/26/2007				4.3 (4.1)									
7/24/2007		9.04		5.4 (4.6)									
8/21/2007	6.81			5.2 (4.6)									
8/23/2007	3.95												
1/25/2008			1200	24 (3.0)	5.4 (0.57)	0.019			68		toxic		
2/25/2008				21 (6.5)	1.9 (1.87)	0.04		0.2	65	5.1			
3/4/2008													toxic
4/29/2008			580	8 (6.9)								toxic	
5/7/2008												toxic	
5/27/2008			250				1.1						
6/24/2008			1300	39 (5.5)									
7/29/2008			1000										
8/26/2008	6.83		390	4.4 (3.7)									
2/7/2009			>2400										
5/19/2009	6.72												

* Water Quality Trigger Limits (WQTLs) are indicated below the column headers. WQTLs for all constituents sampled can be found on the ESIWQC website; www.esicoalition.org
¹ WQTL is based on hardness measured in each water sample and is indicated in parenthesis.